THE FOUNDRY

for February

Build New MANPOWER

EXACTLY as had been expected, those foundries which have been the first to experience the pickup in business have encountered the first shortage in available skilled men. The drift of men away from their pre-depression jobs, in the aggregate would be hard to trace, but individual instances give the trend. Two brothers, employed continuously by one firm for more than 10 years, started a gas station when the shop was forced to lay them off. A foreman on heavy work in a New England establishment for many years found a job as caretaker and janitor in the public school system and is not attracted by the offer of his old job in the foundry. Such instances are multiplied throughout the foundry industry. Many who have been foundrymen all their lives until the depression have been lost to other pursuits.

Meantime, the infiltration of younger men and the training of apprentices has been prevented by the same causes that have brought about unemployment of older, skilled men. Except for a few localities, and a small number of outstanding firms, the foundry industry for many years has been lax in planning and providing education for young employes. Apprentice training has been a virtue favored by the many but practiced by only the few.

As the problem becomes acute, the industry through its national organizations will move to solve it. The attempts to tie in apprentice training with NRA code activity according to the plan announced in its early stages by THE FOUNDRY, and described in the January issue, may prove effective if the industry finds that the garment fits the requirements and some of the Red fringe of the earlier proposals has been removed. Federal assistance might prove both effective and desirable, if shorn of misdirected crusading for social reform aimed at purely imaginary abuses. Under NRA mandatory enforcement, a great many trade practice provisions actually approved in codes have failed. Therefore, any attempt to hitch on second thought, unrelated requirements such as those originally contemplated under the apprentice training scheme, probably will prove equally useless. Most certainly they will if power and duress is invoked and proves another sham.

However, if the action and intent of the Federal organization are helpful and the co-operation of manufacturing interests is cultivated, beneficial results may follow. In any event, the foundry industry needs new manpower. Furthermore, with the unfolding plans relating to unemployment and old age compensation now before the country, an entirely new angle is injected.

The greatest care should be exercised in securing the proper type of individuals both for immediate employment and for training. Careful physical examination of all new employes and candidates for apprentice training should be a condition of employment. Preservation of health always has been a joint responsibility of workmen and employers. Today, the selection of only those physically fit is doubly important.

Across the WATER

THE glamour of imported products still attracts. American buyers, and particularly those who can indulge their taste for luxuries, love the thrill that goes with a purchase from across the water. Else why did the board or committee which recently purchased four 3-ton bronze doors for the Cathedral of St. John the Divine in New York order them made in France. They could have been secured from across the water—in Brooklyn. Or if distance as well as marine transportation was a factor, a considerable territory across the Hudson would have yielded a number of firms capable of producing just as fine doors, serviceable and artistic and made by American foundrymen.

Gray Iron Shop Trains Its Workers

Shop management and operation given in a series of weekly lecture meetings

By PAT DWYER

IN THE foreword to a course of instruction for the employes of the Forest City Foundries Co., Cleveland, the management states that the aim of the course is to discuss and suggest applications of elementary science in foundry operation, shop management, shop safety, good housekeeping, etc., and to furnish employes of the company with references to generally accepted sources of information. Also to stimulate interest of employes in further study and research which in turn will help them to be better qualified for advancement when the opportunity arises.

The course of instruction, inaugurated several months ago, is planned to extend over a year with meetings every second Thursday from 4:30 to 6:00 p.m. Up to the present, interest in the course is indicated by the fact that the meetings are prolonged from half an hour to an hour beyond the stated period. In several instances animated discussion from one session has been carried over to the next following meeting.

Establishment of the course was prompted by the generally recognized changed processes in manufacturing, shortage of skilled help to some extent noted even at present and anticipated to a greater extent in the immediate future, and the ever broadening field of employer-employe relationship. Forward looking manufacturers in every line realize that the major problems of industry include improvement of personnel, improvement of quality in the product, maintenance of production standards and volume, and cost reduction.

Obviously the solution of these problems and the attainment of the desired objective should be secured more readily by a well trained, intelligent corps of employes conversant with all the factors, than by a group of individuals, each one of whom has no knowledge or skill outside his own particular and necessarily limited scope of activity. If one might use an illustration suggested by last year's wave of baseball hysteria, a pitcher who can hit 'em over the wall, is a more valuable member of the team, than a pitcher who is a flop when off the mound.

The scope of the course is shown in the accompanying list of topics scheduled for presentation. In addition to the technical features it will be noted that the course includes several meetings devoted to general subjects connected with

the successful operation of the business. Upon the completion of the course, interested employes will have acquired familiarity with the customer's view point, safety, shop management, job planning, foundry accounts, time study and the part of the foundry plays in the great industrial orchestra, in addition to a detailed knowledge of the manipulation of raw materials and equipment in the sequence of operation required in making the molds and melting the metal.

Before embarking on this educational voyage the management carefully studied available literature on the subject. The plan finally selected is a composite designed to meet the requirements in this particular plant where every member of the class group is familiar with one or more of the items under discussion, but where no member is familiar with them all. Even where certain members are familiar with a given phase of operation, it is felt that additional knowledge may be acquired through the lectures and subsequent discussion.

Having decided upon the details of the program, an outline was posted in the various departments of the plant and an invitation issued to any of the employes who might be interested, to attend the classes. Notice also was given that only those who fully intended to complete the course would be accepted, also that no students would be taken on at any subsequent period. This method of conducting the course was considered necessary to insure the full benefit of the lessons to those in attendance, and to prevent interruptions and back tracking which would be required where members joined after certain sections of the course had been covered. With a view of holding the class to reasonable limits, that is to 35 or 40, which also meant selecting the most promising material, each applicant's request had to bear the O.K., of his foreman.

Prospect of holding the classes in working hours was dismissed as impracticable from an operating standpoint. It was felt that many of the men, particularly those who lived at a distance, would not take kindly to the idea of returning to the plant later in the evening. Finally an acceptable compromise was effected whereby the men remain for an hour or an hour and a half after their day's work is completed. Experience up to date seems to indicate that the plan is perfectly satisfactory. The company contributes the meeting room, furniture and instruction including (*Please turn to page* 64)

Outline of Employe Educational And Training Course for Twenty-four Meetings

No. 1—The foundry, basic industry of the nation. Foundry industry in Cleveland. Foundry industry in Ohio. Foundry industry in the United States. Early history of the industry. Other industries dependent on the foundry. Modern foundry advance. Opportunities in the foundry for technical and skilled men.

No. 2—Pig iron, manufacture, classification and grades. Scrap, grades for various types of castings. Coke, quality best suited for cupolas. Fluxes for gray iron. Ferroalloys, present day use in foundries. Molding sand, requirements, etc.

No. 3—Scrap castings, causes and remedies. Caused by metal. Caused by equipment. Caused by sand.

No. 4—Castings from the customer's viewpoint. What the customer demands. Salesman's selling points.

No. 5—Safety in the foundry. Daily inspection of equipment by users. Weekly inspection by designated men. Written reports of accidents. Head and eye safety. Safety and welfare. Prevention. Ohio safety code.

No. 6—Shop management. Layout of molding floors in regard to time and molding in space, pouring, dumping and cleaning. Speed in filling orders. Overhead expense. Good housekeeping and waste elimination. Personnel and placement of men. Co-ordination of departments and instructions to departments. Methods of cost reduction.

No. 7, 8—Job planning for production. Supervision for first molding, weighting, pouring, shakeout and cleaning, etc. Followup on various heats to find best conditions for job. Record keeping for succeeding orders on same job.

No. 9—Foundry accounts and budgets. Melting, molding, coremaking, cleaning, finishing, shipping. Budgeting operations.

No. 10, 11, 12—Cupola practice. Construction, melting process, effects of elements.

No. 13, 14—Molding theory. Requirements of mold. Action of metal inside. Use and requirement of cores. Shrinkage. Treatment of castings while cooling.

No. 15—Gating and pouring. Shifting weights and jackets. Supervision of night work.

No. 16, 17—Molding sand. Deposits, selection, methods of tempering, sand control, testing.

No. 18—Methods of facing molds. Mixture of facing and advantages.

No. 19—Cores. Core sand deposits. Composition of cores. Core binders. Temperature of ovens and baking conditions.

No. 20—Cleaning castings. When to use tumbling barrels. Loading barrels. Grinding. Sand blasting. Pickling, etc. Inspection.

No. 21—Time study. Comparison of hand and machine methods of molding. Motion study and how it helps.

No. 22—Simple blueprint reading. Making free hand sketches of patterns, equipment, castings, etc.

No. 23—Figuring weight of simple castings from patterns and sketches.

No. 24—Modern gray iron and its part in industry today. New mixtures. New products.

Toronto Selected for 1935 A. F. A. Convention

The Royal York hotel, Toronto, where the sessions of the 1935 convention will be held

TORONTO, the most important foundry center in the Dominion of Canada, has been selected as the 1935 convention city of the American Foundrymen's association. The annual gathering will be held from Aug. 19 to 23 in the Royal York hotel, the beautiful hostelry illustrated on this page. Final decision on the time and location of the convention was announced recently by a committee empowered by the board of directors of the association to make the final choice. The time and place of the 1936 convention and exhibition will be announced later.

The meeting in Toronto will be patterned after a most successful technical meeting which was held in Chicago at the Edgewater Beach hotel in 1927. The entire program will be devoted to technical sessions, shop courses, round-table discussions, committee meetings, plant visitations, and the numerous social functions that add so much to the enjoyment of convention week. As was announced previous to the Philadelphia meeting last year, the 1935 convention will not have an exhibition of equipment and supplies.

In selecting the week of Aug. 19 for the annual convention, the board of directors of the association intentionally has made it possible for foundrymen to combine the benefits of a pageant of castings progress, available through the outstanding foundry event of the year, with the wonderful vacation facilities offered by Canada, the summer playground of the North American continent. Monday, Aug. 19 will be devoted to committee meetings and registration. Technical sessions will begin Tuesday morning and will continue through until Friday noon. While the technical program will include papers covering most recent developments in the art of castings production, the program will not be as confining as in some previous years, and more time will be provided for inspecting plants and some of the many points of interest in and around Toronto.

Canadian National Exposition Follows

The close of the convention on Friday noon will coincide with the opening of the Canadian National Exposition, an internationally known fair held each summer. Special features will be provided for the visiting foundrymen on Friday, as will be announced later.

The Royal York, said to be the largest hotel in the British Empire, offers unusual facilities for every feature of convention activity. The committee has secured a flat rate of $4 for single rooms and $7 for double rooms. Reservations for rooms for the convention week now can be made.

A committee of Canadian foundrymen, headed by L. L. Anthes, Anthes Foundry Ltd., Toronto, and a past president of the A. F. A., now is being organized to co-operate with the association in staging the first foundrymen's convention in Canada since 1908.

Defends Open Price Reporting

Without effective stabilization of prices industry cannot support code wage structure

WIDESPREAD discussion of the withdrawal of price stabilization features of NRA have occasioned much apprehension. A public hearing conducted early in January developed an expression from manufacturing interests that demonstrates that the removal of all such benefits will prove to be a definite setback to the NRA recovery program.

The Steel Founders' Society of America, one of the first organizations within the foundry industry to prepare and secure approval of a code under NRA, has had 14 months experience with the operation of an open price reporting plan with a 10 day waiting period.

Protesting the withdrawal of this feature of its code, Col. Merrill G. Baker, executive vice-president of the society has submitted a brief giving a detailed study of the plan and its effect in the steel castings industry.

Develops a Flexible Basis

Colonel Baker points out that no atempt has been made at price fixing, and that the application of the open price plan instead of "freezing" the price structure has developed a flexible basis which responds readily to free competition through the filing and refiling of prices. This means that eventually the lowest cost foundry establishes the price level for any given class of castings.

Some form of price reporting is essential in an industrial group such as the steel founders' division, according to Colonel Baker. He classifies the steel foundries in accordance to size and capacity as shown in the accompanying table.

In normal times railroads buy approximately 40 per cent of the total tonnage of the industry. Railway and other large consumer interests are represented by large institutions with capable, aggressive buying departments. Consequently, smaller foundries are at a distinct disadvantage in securing accurate information as to going prices and are subject to "chiseling" and misrepresentation by any buyers who may be inclined to misrepresent. However, Colonel Baker points out that most buyers possess a sense of integrity and that they welcome the stabilization offered by an open price reporting plan. He says:

"It has been found generally that under the open price plan a more cordial relationship has been established than existed prior to the code days when many buyers were entirely at sea, never being sure of their position and always fearing that competitors were being given more favorable prices or terms. Now that prices are out in the open, most buyers are content to accept them in the knowledge that they are being given the same treatment that is accorded to others. Moreover, these buyers are identified with businesses which in turn operate under codes of fair competition, in the successful operation of which they are naturally interested and are therefore disposed to adopt a more fair and reasonable attitude toward those from whom they purchase their materials."

The buying policies of federal, state, and municipal buying agencies are deprecated. It is pointed out that the castings requirements from these sources are of special character, of an individual type and generally in small quantities. As a result the production costs for this type of work are considerably higher. Furthermore, inspection often is more critical and closer limits for rejection are employed. For this reason, prices to governmental agencies in justice to other customers should be higher while actually they are lower. However, Col. Baker states:

"Sixty-five per cent of the complaints of violations of the price provisions of the open price plan, operating under (*Please turn to page* 50)

Steel Foundries in the U. S. Arranged in Groups According to Size

Rated Capacity Net Tons Per Month	Number of Foundries	Total Capacity of Group	Average Capacity of Group	Per Cent of Total Number	Per Cent of Total Capacity
1 to 100	54	2,421	45	30	2
101 to 250	41	6,988	170	23	6
251 to 500	34	12,511	368	19	12
501 to 1000	25	16,795	672	14	16
1001 to 2500	15	23,267	1,551	8	21
2501 to 5000	5	18,053	3,611	3	16
Over 5000	5	29,698	5,940	3	27
Totals	179	109,733	613	100	100

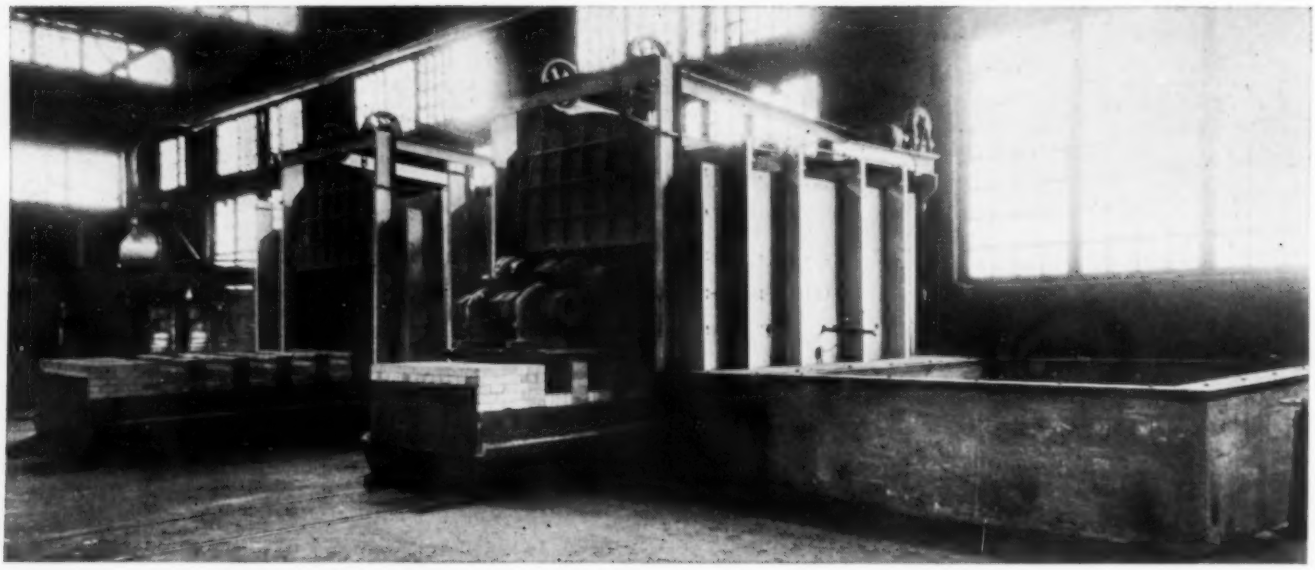


Fig. 1—Gas-fired heat treating furnaces equipped with automatic temperature control

Heat Treating Steel Castings

Improve physical properties of plain and alloyed steel by quenching and tempering

By JOHN D. KNOX

BOTH carbon and alloy steel castings show greatly improved physical properties—static and dynamic—when heat-treated by quenching and tempering. Compared to annealed steel castings the elastic limit is increased about 45 per cent, ultimate strength 25 per cent and impact strength, as measured by Charpy and Izod tests, about 100 per cent. Furthermore, the machinability definitely is improved.

In the accompanying table the physical values are the average of 1880 heats of 0.30 per cent carbon basic open-hearth and acid electric steel. Tests were made on 1½-inch square bars which were annealed or heat treated and machined.

The brinell hardness of the heat treated casting, as will be noticed, is higher than the annealed casting, and because of the uniform structure the machining qualities are highly satisfactory. At the plant of the Bonney-Floyd Co., Columbus, O., where the heat treatment of steel castings is carried out on a large scale, every facility is provided for controlling the various steps in the process. Complete laboratory equipment for testing and controlling the metals and heat treating results is available and a uniform product is secured by careful metallurgical procedure in every stage of the process.

Fig. 2 shows what can be done by the heat treatment of steel castings. This graphic representation of the physical properties depicts clearly the evolution of a carbon steel test bar to its optimum properties, or in other words the properties existing in the as-cast, annealed normalized—tempered and quenched—tempered conditions.

Certain rules are observed to avoid cracking during the quenching operation. Thoroughly refined metal is of prime importance. Then, too, the cast steel commodities must be at a uniform as well as the proper temperature before subjecting them to the quenching bath. Finally, the temperature at which the castings are removed from the quenching bath, also has an important bearing on the results.

Each of the heat treating units shown in Fig. 1, is served by a car bottom hearth 5 feet wide and 9 feet long, the height from the car bottom to the start of the arch being 3 feet. Heat losses are held to a minimum by insulating the furnace and hearth of the car. The units are gas fired and a non-oxidizing atmosphere is maintained by burners and mixers of the proportional type. Automatic electric recording pyrometers control the

temperature throughout the heating and tempering periods.

Design of the furnace and car assures a circulation of hot gases and a uniform temperature in the heating chamber. Batches of castings are loaded on a tray and are transferred from the furnace to the quenching tank by an overhead crane. The hoist is equipped with a semiautomatic latch which automatically takes hold of the tray when lowered, thus avoiding any delay in handling the charge. Only about 40 seconds is required to transfer the work from the furnace to the quenching bath. Therefore, little time is available for the outer parts of the work to air-cool below the critical point. The furnace door hoist and cars are motor driven, their actuation being controlled by push button either from the floor or crane.

Table I

Physical Values of Plain Carbon Cast Steel

	As-cast	Annealed	Heat treated
Ultimate strength, lbs. per sq. in.	74,100	75,000	80,000 to 125,000
Yield point, lbs. per sq. in.	37,100	41,500	50,000 to 97,000
Elongation in 2 inches, per cent	19.5	24.5	30 to 10
Reduction of area, per cent	31.0	46.2	65 to 20
Brinell	160	145	155 to 250
Izod	16	20	48 to 15
Endurance ratio	0.40	0.44	0.50

Table II

Changes by Annealing and Heat Treating

(As-cast considered as unity)

	Annealed, % change	Heat treated, % change
Ultimate strength	+ 1.1	+ 12.6
Yield point	+12.0	+ 53.8
Elongation	+30.8	+ 61.5
Reduction of area	+51.7	+124.1
Brinell	— 8.3	+ 2.5
Izod	+23.5	+158.8
Endurance ratio	+10.0	+ 25.0

In heat treating small bevel gears for power shovels, rolling mill conveyor tables, etc., each end of the bore is plugged for the purpose of drawing the center to the desired temperature. The process is patented. Following the heating period the work is placed in the quench tank, the time of immersion depending on the size of the gear and the number of teeth. The bevel gear for rolling mill conveyor table service, shown in Fig. 5, was heat treated by this method to a brinell hardness of 187 at the bore and of 331 at the rim of the teeth, or a differential of 144 points.

The boom swing pinion for power shovels, shown in Fig. 3, has a brinell hardness at the rim of 223, at the base of the gear teeth of 341 and at the bore of 212. The spur gear for rolling mill service, shown in Fig. 4, has been differentially heat treated for a hardness at the teeth of 341 and at the bore of 179, brinell numbers. The Bonney-Floyd Co. recently furnished large wheel centers for high-speed electric locomotives made of heat treated carbon steel. The diameter of the wheel is 56 inches and of the hub 18 inches. The 13 spokes each are 2¼ inches thick at the hub and taper to 1½ inches thick at the rim. The weight of the wheel center in the rough state is 1650 pounds. Three centers were poured per heat of acid electric steel.

Three wheel centers were water quenched and drawn simultaneously, the physical values averaging 94,020 pounds per square inch in ultimate tensile strength, 69,480 pounds per square inch yield point, 26 per cent elongation in 2 inches, 61 per cent reduction of area and 180 brinell hardness.

Large increases in the allowable fiber stress in cast machine parts has permitted uses of heat-treated low-carbon steel to reduce the weight and cost of castings. The heat treatment provides a tough, wear resisting hard- (*Please turn to page* 53)

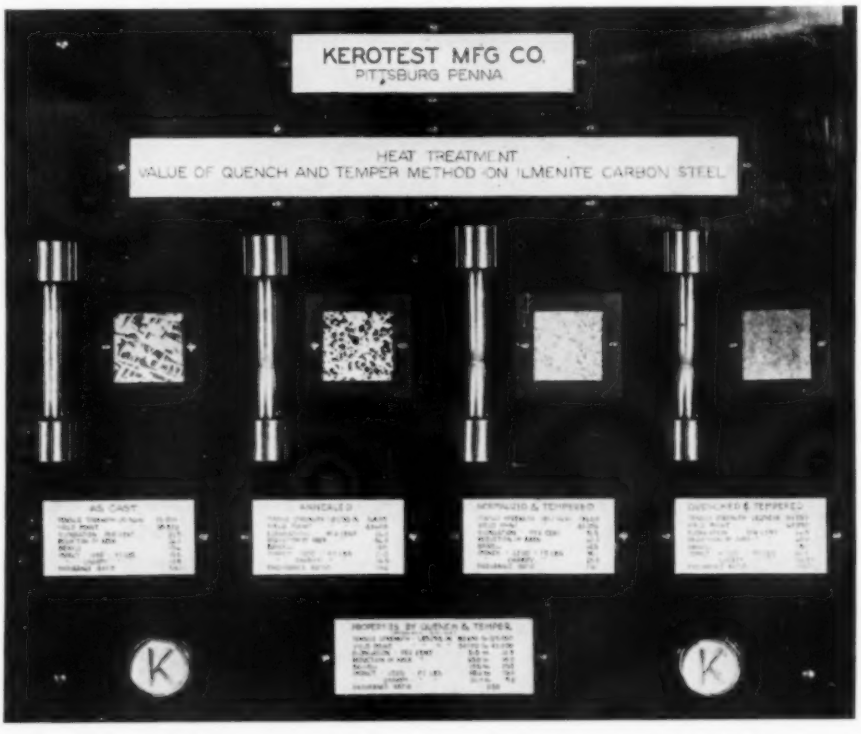


Fig. 2—Graphic representation of physical properties of test bars

Stressing Interest of Buyers Sells Foundry Products

By WILLIAM BALSAM

TODAY, in every community there are foundrymen who, because they have kept step with progress and improved their product believe they have penalized themselves in competition with producers of indifferent castings, whose apparent costs are low. A current survey of the market methods used by production jobbing foundries in 22 key cities indicates that in a large measure this penalty obtains only insofar as the casting buyer is kept in ignorance of the practical cash advantages accruing to him from the improved castings. In most instances, the recently improved physical characteristics of castings have left a wide gap between the castings and the salesmanship employed in their distribution.

Salesmanship as applied to foundry products like salesmanship in other fields, is good or bad only to the extent that it closes business. The seller's opinion of his own salesmanship is incidental. Many men are too captivated with their own opinions of salesmanship; too positive that their reactions are typical of other buyer's reactions; too cynical of appeals which do not appeal to them; too much in love with those that do. Thus, instead of stirring their prospects to action, the seller often merely excites his own emotions and bemoans the fact that there are those who produce low grade castings for the gullible public.

Use Trial and Error Method

Sales methods must be objective to secure desired results. They must tell facts interesting and acceptable to the buyer and sufficiently forceful to get the order. If a foundryman is successful in selling material by saying to his prospect, "There is a certain satisfaction in buying sound, uniform castings from a dependable source of supply," the salesmanship is good. For the unsuccessful seller to conclude that his prospects already enjoy dependable sources, or that they prefer to purchase on price is an irrelevant deduction. The wide-awake salesman, following the definite, objective method, will supplement his first attempt with, "Because of our controlled molding and pouring routine and careful pattern handling, you won't often have to machine our castings for oversize. Bosses and lugs won't 'shift.' We will cut down your time losses on filing, shimming, or adding washers. Thus, we'll save you a lot of money which will make the slight extra first cost of our casting look like chicken feed." If that sales attack sells only 3 out of 20, and does as well subsequently, it should be made one of the props in the presentation regardless of the effect it has on anyone in the sales organization. The only substantiation necessary is prospect acceptance.

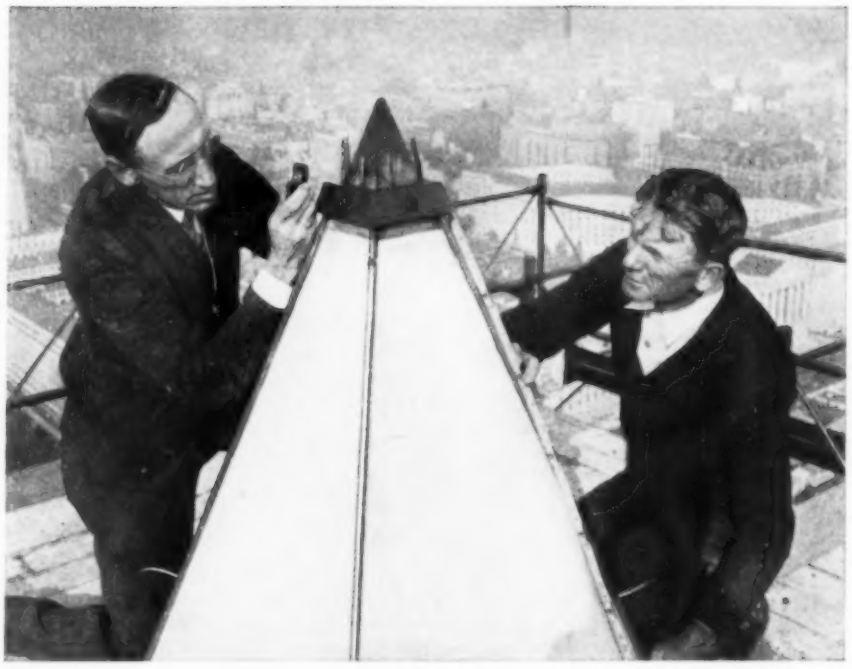
Buys Castings on Quality Basis

Undoubtedly, a great many foundrymen will find that when they talk in terms of profit or costs, their statements will be well deserving of a place in the success program which they are bringing into existence. The man who buys castings for quality's sake seldom needs to be sold on the idea. It is the man who can be persuaded to put castings in his product though that product is not a *quality* item, who makes up the margin for increased sales of high grade castings.

The word quality is not the magnet which will convince him that yours is the dotted line upon which to sign, for he will buy the better castings more to step down his products' costs than to step up their quality. He may buy a $14 pair of shoes because of pride or comfort, but he can't often indulge these predispositions in his business. The casting offered is merely an incident on a business man's road to making profit for himself. If, when the castings seller points out to the prospect the superiority of the technology and characteristics of his castings, he receives the reply that the cheap castings being bought are *good enough*, he must be ready to explain why it is that by paying 2 cents more, the purchaser will save 6 to 9 cents net on every casting.

A SALES ARGUMENT WHICH FAILS TO MAKE THE SALE WILL, IN MOST CASES, ANTAGONIZE THE BUYER WHOM IT DOES NOT CONVINCE. In the cases in which the person approached is not antagonized, the fact still remains that the argument has been ineffective and has no place in the sales program.

Star salesmen brought in from the outside are not necessary. (*Please turn to page* 54)



After a half century of service only a small amount of pitting could be observed

Cast Aluminum Protects Monument

Recent inspection shows cap in good condition after 50 years of service

WHEN engineers in charge of construction of the Washington Monument came to the erection of the tip of the structure in 1884, their greatest concern was in finding the metal best suited as a conductor of electricity. The monument, towering 555 feet into the sky, would be sure to attract lightning many times, and it was not desired that the top should be marred when struck by lightning during electrical storms.

Colonel Thomas Lincoln Casey, engineer in charge, submitted a report to the Washington Monument commission in which he proposed to make the tip of phosphor bronze, but added that he would prefer aluminum. The latter metal, he feared, could not be produced in this country, and to send to France for it would make the cost prohibitive.

William Frishmuth, head of a Philadelphia laboratory, heard of this and informed Colonel Casey that he was able to make any type of aluminum cap desired. On receiving this information, Colonel Casey commissioned Frishmuth to proceed with the casting. The pyramidal cap is about 9 inches high and 5.6 inches across at the base. Today it is the most famous single item of aluminum in this country.

At the time the tip was made, aluminum was considered a precious metal. Thirty years earlier, it cost $545 a pound, but improvement in manufacturing technique had brought the price of the metal down to about $18 a pound. Aluminum still was made by a chemical process in which sodium was used, and metallic sodium was costly. As a result, the government paid $1.10 an ounce for the metal in the monument tip. Frishmuth obtained the aluminum for it from South Carolina corundum. Hall's discovery of an electrolytic process by which aluminum could be made at a lower cost did not take place until 1886.

The cap again came into public prominence last autumn when $100,000 was appropriated for a general reconditioning of the shaft. Government engineers, metallurgists, and officials of Aluminum Co. of America, were interested to see how the cap had weathered after 50 years' exposure—a matter of (*Please turn to page* 58)

Fig. 1—Addition of calcium silicide to the molten stream causes generation of considerable heat

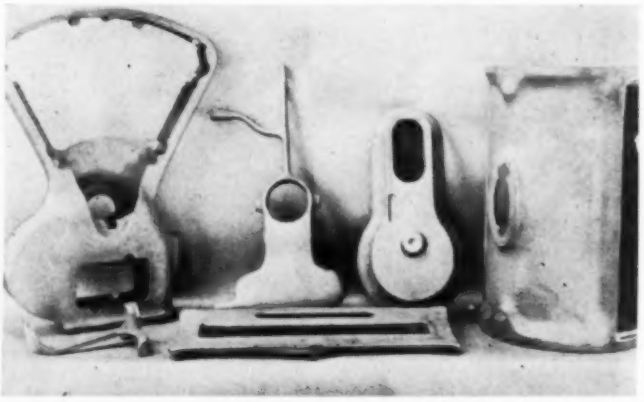
Specializes in Jobbing Castings

High quality gray irons from regular and special cupola operations are produced

By EDWIN BREMER

DEMANDS of various industries for high grade gray iron castings have led to numerous developments in the iron foundry field to meet definite physical specifications. Undoubtedly, one of the first efforts along that line was the use of the air furnace in producing gray iron for cannon, and in that process careful attention was given to selection of the pig irons employed. That choice was made from observations of fractured sections of the pigs, and to insure uniformity of the final iron, the metal was melted, cast into pigs and remelted again before pouring into castings.

While excellent results were obtained, considering the state of the foundry art at that time, the process then was regarded as slow and costly. Consequently a great many innovations were proposed for the cupola with the idea of making it capable of producing iron similar to that made in the air furnace. Those innovations mainly were concerned with construction and included specially shaped interiors, central tuyeres, specially designed tuyeres, etc. In themselves those devices probably did not aid greatly in making iron of better quality, but there is no



No. 2—A group of scale castings including fan and cylinder type housings, levers, base and dialplate cover

doubt that attention to combustion, which was involved in those developments, was responsible for higher grade gray iron, although it was some time before that factor was recognized.

Later attention was directed to the addition of steel scrap to the metal charge, first in small quantities, and then fairly large amounts. The resulting iron was termed semisteel and in some instances still bears that designation. Metal of that type has physical properties much superior to the average iron made without steel scrap additions. Advent of the chemist and later the metallurgist in the foundry field brought a general improvement in gray iron quality, and the introduction of alloy cast iron.

Would Give White Fracture

During the early development of high quality gray iron about 15 years ago, a new discovery was made for obtaining such a product in an entirely different manner. It involved the use of mixtures which ordinarily would produce castings white or mottled in fracture, and the employment of a ladle addition to the molten metal which would result in castings with a gray fracture. The process was developed by the late Augustus F. Meehan, and the resulting iron is produced by a number of foundries at the present time under the tradename Meehanite.

The Hamilton Foundry & Machine Co., Hamilton, O., one of the foundries producing that iron, operates a modern jobbing shop supplying castings ranging in weight from a fraction of an ounce up to 800 pounds. Not all of the castings produced by the firm are that special metal, as requirements, while of high standards, are not such as to necessitate extremely high tensile, transverse and impact strengths which result from the process.

The process employed for obtaining Meehanite consists essentially of using steel scrap additions in the cupola charge, and adding calcium silicide to the ladle. Amount of steel scrap added may vary from 50 to 70 per cent or higher, depending upon requirements of castings to be produced, although it usually is in the higher ranges. As may be expected, the quantity of calcium silicide added also will vary. To insure accurate additions of calcium silicide to the ladle, the Hamilton Foundry & Machine Co. employs a special device located on the cupola, to one side and above the spout.

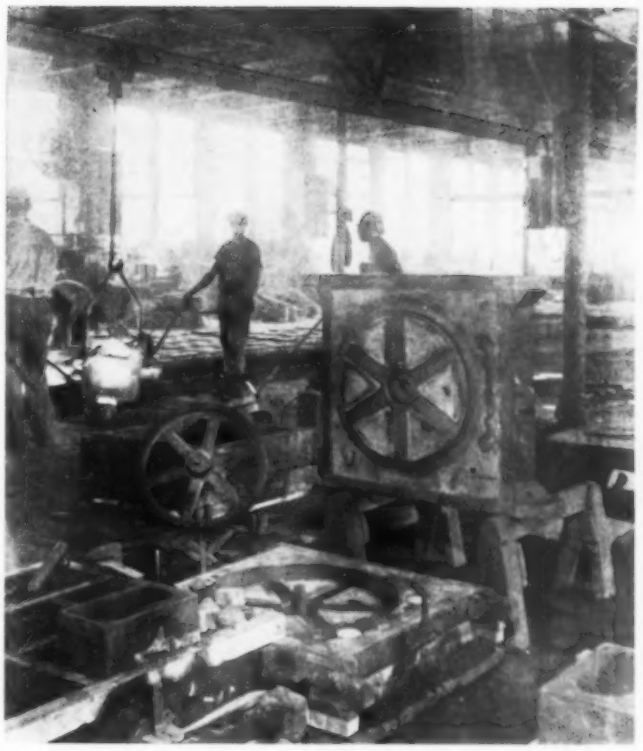
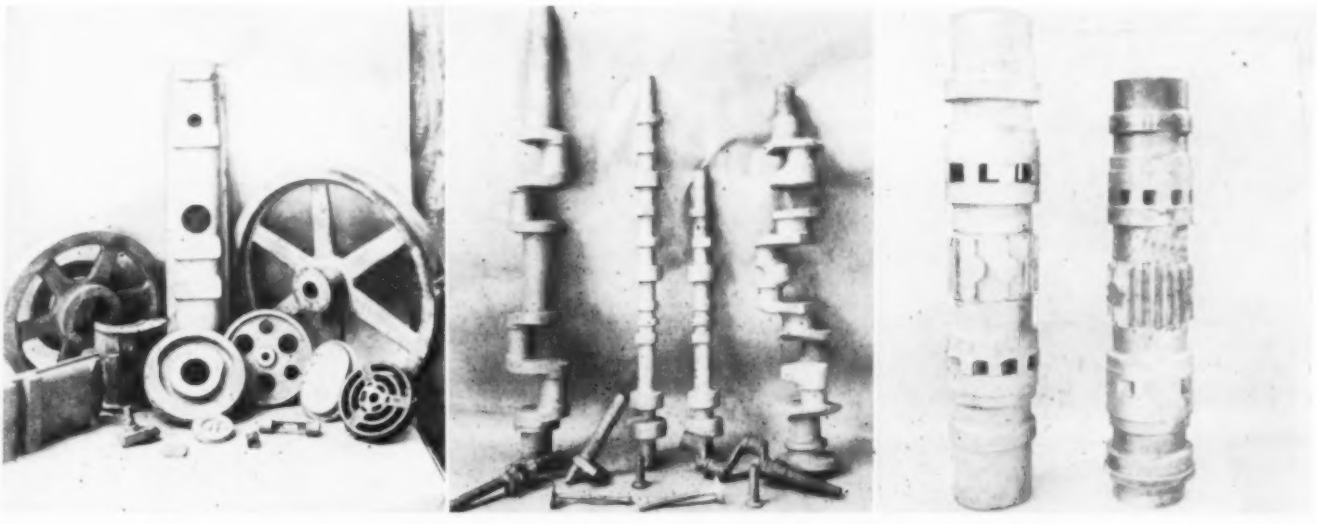


Fig. 6—Finished cope and drag molds for a gear blank just before closing

The device consists of a storage tank or hopper, with a motor driven feed gate discharging into a long spout which conducts the calcium silicide to a point at the center and near the end of the cupola spout. Speed of the motor and



Figs. 3, 4 and 5—Groups of castings made from special process cupola iron which include gear blanks, cams, machine tool slides, crank and camshafts, valves, and diesel engine cylinder liners

Fig. 7—Finishing the drag half of a mold for a 24-inch gear blank

consequently the feed gate, is controlled by the operator so that any definite amount of silicide can be added to a given quantity of metal as it flows into the ladle. As may be assumed, the method of adding the silicide insures thorough mixing.

It is said that in the production of the special iron, its silicon content need not be held within the strict limitations that are necessary with usual steel scrap mixtures, but that within certain limits, the steel content of the charge must be increased with the silicon content. To give some idea of the physical properties of the iron it might be well to cite some examples. In a mixture composed of 60 per cent steel scrap, cast iron scrap and sufficient high silicon pig iron to give an analysis of 1.2 per cent silicon; 2.8 per cent total carbon; 0.6 per cent manganese; 0.10 per cent sulphur and 0.18 per cent phosphorus, the tensile strength was 49,000 pounds per square inch; elongation 0.50 per cent; brinell hardness number, 237, and modulus of elasticity was 28,600,000 pounds per square inch. In another mixture containing 70 per cent steel scrap with an analysis of 2.81 per cent total carbon; 1.65 per cent silicon; 0.8 per cent manganese; 0.115 per cent sulphur and 0.185 per cent phosphorus the tensile strength was 46,000 pounds per square inch; elongation 0.5 per cent; brinell hardness number 255, and modulus of elasticity 27,800,000 pounds per square inch. In the first metal mentioned 120 ounces of calcium silicide per ton of iron was added while in the second the addition was 100 ounces per ton.

Has Numerous Applications

Applications of Meehanite metal are shown in Figs. 3, 4 and 5, which are representative castings made by the Hamilton company. The group illustrated in Fig. 3 includes gear blanks, cams, machine tool slide, compressor valve seat, etc. Fig. 4 shows several different crankshafts, camshafts, and valves, while Fig. 5 illustrates a diesel engine cylinder liner before and after machining operations. Descriptions of molding methods used in producing some of those castings should be of interest.

The gear blank shown in Figs. 2 and 7 is 24 inches in diameter with a 3-inch face. As may be observed, the blank has 6 arms or spokes. It weighs about 100 pounds, and is made by hand in one hour by one man. There is nothing unusual in making the mold except perhaps that since a number are put up each day, a hard sand match is used in producing the drag mold to eliminate the necessity of cutting the parting line as would be the case if a plain roll-over board was used. (*Please turn to page* 58)

Fig. 8—Fan type scale housings are made with green sand cores. four-man crews. Two men make cores and two men the molds.

Fig. 9—Cylinder type scale housings are made by A better view of the castings is shown in Fig. 7

Mixtures for Small Propellers

Certain difficulties must be overcome in melting an aluminum bronze alloy

By JOHN DUFFY

TO THE nonferrous foundryman the most interesting part of a power driven small vessel undoubtedly is the propeller which gives the boat its motion. Therefore it is remarkable that in many instances the fabrication of small propellers has not been specialized, but still is listed in the category of jobbing work. A great saving can be made by the foundryman who standardizes propellers and places them at least on a semiproduction basis. The alloy used generally is aluminum bronze and the average jobbing brass foundryman is rather averse to handling this metal. With proper care it is manipulated as readily as any of the ordinary bronzes.

Three bladed wheels are the most popular. Making a whole pattern in wood is not recommended. Wood is liable to warp when finished, resulting in a casting out of pitch and balance. A much better way is to make wood boss and with segments of the contour of the blade make a pattern for one blade and pour a casting in white metal. When cleaned this can be used for making the three blades for a pattern, or for a casting if only one is required. In this way it is reasonably certain that the three blades are true to shape and of uniform thickness and weight.

Where many duplicate castings are ordered it is advisable to mount the pattern on a pair of follow boards and not on a matchplate. Size and shape of the pattern militates against the matchplate through its liability to shrink and also warp. A match or followboard made from plaster or other somewhat similar material will effect a considerable saving in molding cost. Such a match or follow board with separate parts for drag and cope will ensure castings with anticipated blade thickness and uniform weight.

Metal enters the bottom of the hub through a horn gate. The sprue in the cope is placed close to the side of the flask and a channel connecting it to the horn gate in the drag is cut in the cope.

Melting the metal presents certain difficulties, but if the proper procedure is adopted the result will be satisfactory. An aluminum bronze alloy for a propeller contains 87 per cent copper; 9 per cent aluminum; 3 per cent iron; and—this is optional—1 per cent zinc.

When melting aluminum bronze without zinc, it should be borne in mind that if iron is added to copper free from aluminum, iron oxide will be formed. This iron oxide may not be completely reduced when aluminum is added later. Copper alone does not dissolve iron readily. Melting practice varies to some extent depending on whether the charge is made of all virgin metal, or, of new metal and gates.

Method of Mixing Metal

If all virgin metal is used the alloy is prepared in the following manner: 1—Melt half the copper under charcoal. 2—Stir in about 1 pound aluminum to deoxidize the copper. 3—After a few minutes push about half the aluminum under the molten copper. 4—Push all the iron under the melt. See that none sticks above the surface. 5—Push the remainder of the aluminum under the surface. 6—Add the last half of the copper, which in the meantime has been preheated. Placing half the copper on top of the pot helps to force the iron and aluminum into the molten mass. 7—Cover again with charcoal. 8—When all is melted, stir carefully, add flux and stir again. Two pots of this metal are poured into a larger pot for better mixing and this in turn is poured into ingots which are remelted for the propellers.

(*Please turn to page* 61)

Flux for Aluminum Bronze

Material	Weight, Pounds	Resulting analysis, Per cent
Manganese copper (30 per cent)	20	Manganese 6
Magnesium	2	Magnesium 2
Calcium copper (10 per cent)	10	Calcium 1
Aluminum	35	Aluminum 35
Copper	33	Copper 56

Use Plaster For Foundry Patterns

Outlines method for making core dryers and describes plaster transfer frames

SEVERAL methods are available for making the pattern and corebox equipment required in the production of soil pipe fittings and other castings of a somewhat similar character. In an emergency an existing casting has been sawed in two longitudinally and used as both pattern and corebox. Wood coreprints have been fitted in the ends of the pattern to make the mold. Then the prints have been removed and one half of the pattern has been sunk in a wood frame containing hollows for the corresponding prints at each end. Two half cores are made, dried and pasted and then placed in the mold.

Occasionally pattern and coreboxes are made by the so-called block system previously described, that is by making a mold from a solid pattern and then lining the face with clay or wax strips. By ramming the obverse part of the mold against this lining and then removing the lining before the mold is closed, the desired thickness of metal is secured in the resulting casting.

Plaster Employed to Advantage

In some instances wood master patterns, exact duplicates of the desired castings, whether patterns or coreboxes, are prepared for the foundry. However, in many instances a pattern of that kind would be too fragile and would become broken or distorted in the process of making the mold in sand. In these instances plaster may be employed to advantage in first cost and in final results. Nearly all these castings are symmetrical and split on a longitudinal horizontal line. Hence in the following description when the term pattern is employed, it really only refers to a half pattern. In minor detail the process will differ to some extent where the pattern is not symmetrical, or where it presents an irregular parting line, but the principal features remain the same. Also it is pertinent to point out that since many of these castings are circular in cross section, the original master patterns or dummies are turned in the lathe from two blocks of wood doweled and joined on the usual center line. Only one half is utilized in making the plaster patterns.

Since the metal thickness in the pattern and the corebox may be the same it is apparent that two pairs of almost similar half castings will be required. One pair on which the outside surface will be utilized for forming the mold later in service, and the second pair on which the inside surface will be utilized for forming the cores. Practically the only difference between the two pairs is a slight adjustment of the core prints at the ends, and a set of hinges and brackets on the pair of corebox castings which are not required on the pattern pair of castings.

To simplify the drawings and description as much as possible it is assumed that the pattern and corebox are for a plain piece of pipe 4 inches diameter, 8 inches in length and ¼-inch thick. The original pattern equipment will include one half cylindrical piece of wood 4 inches diameter and 11½ inches in length corresponding to the core, including 2 inches at each end 3½ inches diameter for the prints, and one half cylindrical piece of wood 4½ inches in diameter and 8 inches in length corresponding to the pipe casting. Additional small pieces will include two semicircular disks ¼-inch thick and 4 inches diameter, hinges and brackets for the outside of the corebox, and a few pieces of ¼-inch lagging 2 inches in length. The difference in shape between the end of the corebox and the inner end of the pattern is shown in Fig. 23.

Located Accurately by Center Lines

The core stick *A*, Fig. 24 is located accurately by two center lines on a flat board and surrounded by half a snap flask heavily smeared on the inside with tallow, oil or grease. The core stick and the board are treated in the same manner. Then the flask is filled with plaster. This plaster mold is lifted off and turned over. Two green sand drags are rammed in succession on this plaster mold, lifted off and placed on the floor. It is readily apparent that these drags will carry a sand replica of the core stick on the joint surface.

Core stick *A* then is removed from the board and replaced by the pattern corresponding to the shape of the outside of the pipe casting. It is located by the same center lines. One part of a snap flask is placed in position, rammed full

of green sand, lifted off and placed on one of the two drags rammed previously. A good cope is prepared in the same manner and placed on the second drag. When the two castings are poured they constitute the two halves of the pipe pattern including core prints at the ends. They are fitted with dowel pins on the joint and finished for service in the usual manner.

Minor adjustments are made on core stick and pattern. The prints on the core stick are lagged ¼-inch to secure a uniform diameter throughout, and the ¼-inch half disks are attached to each end to secure the necessary length of 12 inches. The half snap flask is removed from the first plaster block and again utilized to make a plaster negative of the core stick *A* in the new form. Two green sand drags are made on this negative and placed on the floor as in the former instance. The mound of sand is brushed with plumbago to insure a clean, smooth surface on the inside of the corebox.

The second pattern, that is the piece for forming the outside of the corebox then is placed on the board. It is located accurately by the center lines and screwed to the board. The half disks are nailed to the ends of the prints and the short pieces of lagging are placed around the print. In that manner the diameter of the piece is uniform throughout and the total length is increased by ½-inch, or ¼-inch at each end. Lugs are attached to the sides to form hinges and ribs are attached near each end to serve as supports for the box when in use. In some instances the hinges are bolted in place after the castings are made.

Mold Made in Green Sand

The mold is made in green sand as in the former instance. Mold and board are rolled over and the board with pattern attached is lifted away from the sand. After any necessary minor repairs have been completed, the mold part is closed down over the existing drag. The same process is repeated for the second half of the corebox.

In a variation of the foregoing method, the plaster negative for the pattern or corebox is removed from the board and turned over. Clay or wax sheet cut in strips is used to line the plaster to the required thickness of metal. A second frame then is placed on top of the first and filled with plaster. The two halves are separated and the clay or wax is removed. The mold then is reassembled and liquid plaster or one of the proprietary compounds is poured into the mold to form a duplicate of the required pattern of the desired cast part.

In many instances where the shape of the core will not permit placing it upon a flat plate, a dryer shell is provided to support the core while in a green state. Usually cores of this kind are made in considerable numbers thus necessitating the use of a large number of dryer shells. Plaster lends itself readily to the production of either a master or a working pattern for making these shells.

In one method for making the plaster pattern for the shell, a core stick conforming to the shape of the core is attached to a flat board. It is surrounded by a shallow frame approximately ½-inch deeper than the pattern and with a clearance of ¼-inch at the ends and ½-inch at each side. This frame is filled with plaster. After the plaster has set it is removed and the excess plaster whittled away to provide a uniform thickness throughout.

In a second method shown in Fig. 25, an existing corebox is filled with plaster. The drag half of the corebox is removed and replaced with a shallow wood frame. (*Please turn to page* 62)

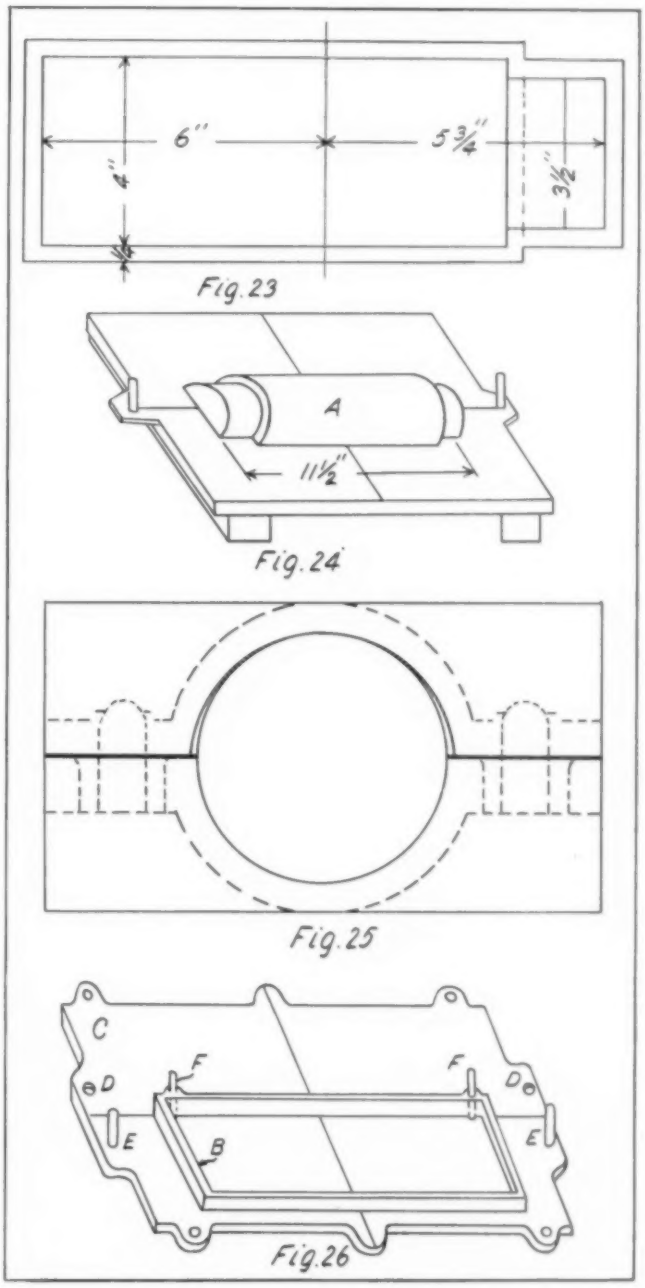
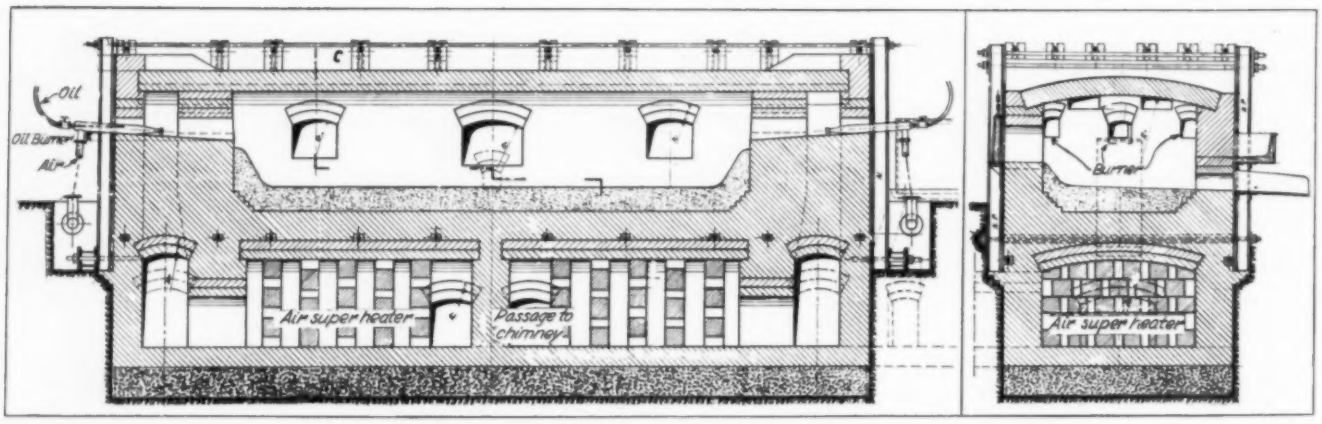


Fig. 23—Showing difference between end of corebox and inner end of pattern. Fig. 24—Half pattern mounted on center lines. Fig. 25—Pattern for dryer shell. Fig. 26—Showing application of plaster transfer frame



Figs. 1 and 2—Sectional views showing the construction of the furnace with burner, hearth and air superheater

Iron Superheated in Open Hearth

German furnace with stationary or tilting hearth is provided with two superheaters

By FREDERICK BROCKE

PRODUCTION of sound castings is the first objective of every foundry manager. The necessity of producing sound castings becomes more imperative in accordance with the exacting character of the work for which the castings are designed. In no section of the engineering field are the working conditions more severe than in the heavy oil combustion engine. Cast iron is used for the major parts of these engines. The metal must be made as suitable as possible for the varied requirements of the different parts.

Metal melting is the first and most important problem in the foundry. Gray iron foundrymen know that it is extremely difficult to keep cupola melted metal under perfect control in regard to the chemical composition, contamination from the fuel or gases, temperature and the thorough mixing of the various constituents.

For several years metallurgists have wrestled with the problem of melting large percentages of steel scrap or low carbon pig iron in the cupola for the production of high test iron, and the subsequent pouring of the metal into molds to obtain the desired results. The short freezing range of low carbon iron militates against the use of dull iron. The metal must be poured as hot as possible to prevent porosity and to insure reasonable machinability. Many foundrymen incorporate alloys in the charge to facilitate machining operations and to eliminate the formation of hard spots. Alloys serve a useful purpose in the production of high test iron and in many instances the increased cost is justified by resultant economies.

One of the simplest (*Please turn to page* 64)

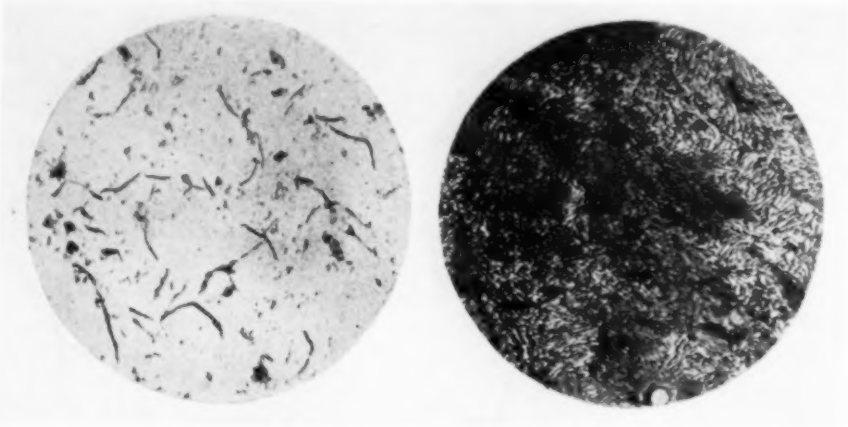


Fig. 3 (Left)—Micrograph of iron showing pearlitic structure, unetched. X100.
Fig. 4 (Right)—Micrograph of same iron, etched nital. X500

Points To Causes of Porosity

Remedial or preventative measures lie in the hands of the supervisory force

By R. A. BULL

FOR convenience in presentation a list of causes responsible for porosity in steel castings is shown under 25 heads. Obviously under suitable subdivisions the list might be expanded to a considerable extent.

1.—Volatile matter in furnace spout may be caused by use of molasses or other liquid binders in, or by insufficient drying of the spout lining. The safest plan is to make up the spout lining without any gas forming ingredient that feasibly can be eliminated. It is advisable to dry the spout lining thoroughly, and to avoid any last-minute smoothing or patching with moist material, where part of the spout lining may have spalled or cracked while drying.

2.—Insufficient dryness of ladles may be due to a generally poor shop system or to occasional carelessness. Every part of a ladle which comes into contact with the liquid steel should be made red hot if possible before the metal touches it. The practice of daubing a ladle lip with green molding sand or a clayey mixture is badly overdone in some foundries, and always should be avoided if possible. Moisture in plastic material is changed to steam when the steel flows over it, and some of this gas is likely to be absorbed by the metal.

3.—The objectionable effect mentioned in the previous item can be produced by using for ladle linings certain dry materials that form considerable gas when in contact with the hot metal. Substances that are capable of forming gas under these conditions include all the farinaceous binders.

4.—Vent holes in ladles may be insufficient in number or plugged with refuse material that should have been removed. Steam generally is created in a ladle lining when the vessel is filled with liquid steel and holds it for a considerable period of time. If the steam cannot escape through the lining and pass out through vent holes, it may be absorbed into the steel and cause porosity.

5.—Frozen metal in the form of a ladle skull has an oxide formed on its surface as the result of contact with the atmosphere. This iron oxide may generate gas when molten steel is poured on top of the scull. If gas is developed in this way, it is likely to be taken up by the liquid steel.

6.—Inadequate final degasification in the ladle may be due to disregard of instructions as to adding proper amounts of aluminum or other degasifiers. Such material is most effective when put into the ladle immediately before it receives the steel, or when special methods are employed for plunging the degasifier into the filled ladle in such manner as to secure good distribution. Regulated additions of any material to a teapot ladle are extremely difficult to make effectively.

7.—After the steel is removed from the furnace, contact with the atmosphere permits absorption of oxygen. This can result in appreciable degree from a very long carry of shank pot metal. Obviously, a bottom-pour ladle emptying steel directly into molds results in minimum atmospheric contamination of the steel. The oftener the metal is transferred with its surface exposed to the air, the more opportunity there is for oxygen to combine with some elements in the steel and form oxides that may injure the metal by causing porosity or other defects in the casting.

8.—Whenever carbon powder, ferrochromium, or other similar material is placed in a ladle for changing the chemical composition of the steel, gas is produced. If any such material is added to the large ladle at the furnace spout, the gaseous condition of the steel that goes into a mold is not likely to be so pronounced as when the same proportions and kinds of alloying materials are put into shank pots used in conjunction with bull-ladles just before molds are poured. The time element is important in permitting the developed impurities to rise toward the surface of the metal. These compounds are partially or wholly nonmetallic and are lighter in weight than equivalent volumes of relatively pure steel. Extra precautions need to be taken to prevent pin holes in castings when making ladle additions for alloying purposes, especially in the use of hand ladles. *(Please turn to page 70)*

Questions and Answers

Covering important problems found in all phases of modern foundry practice

This department includes problems relating to metallurgical, melting and molding practice encountered in making castings. Questions from subscribers addressed to the Editor of The Foundry will be answered by members of the editorial staff, supplemented where occasion requires by the advisory staff.

Suggests Foundry Loss Should Be Held Below Five Per Cent

We manufacture warm air furnaces, coal ranges and circulating heaters. All large patterns are equipped for machine molding and most of the smaller patterns are fitted for production on squeezer machines. We have spared no expense in providing the best equipment and materials. Recently the subject of losses has aroused a controvery between the men and the management. The management holds that the loss should not exceed 5 per cent. The men claim that 5 per cent is too low to adopt as a standard of efficiency.

We presume you refer to the percentage of defective castings from each heat. As with many —perhaps the majority of—foundry terms, the term *foundry loss* is extremely elastic and considerable explanation usually is necessary to determine whether a speaker or writer means: (a) the total loss represented by the difference between the total weight of the cupola charge and the weight of saleable castings, (b) the furnace loss represented by the difference in weight between the total cupola charge and the total weight of iron recovered from the floor, castings, gates, sprues and scrap, (c) the weight of defective castings expressed as a percentage of the total cupola charge, (d) the weight of defective castings expressed as a percentage of the total weight of castings produced.

Your reference to the generally accepted opinion that a loss not exceeding 5 per cent represents good foundry practice, seems to indicate that in this particular instance the term *loss* applies only to the last item in the category, the percentage of defective castings in relation to the total weight of castings produced over any given period, usually a month.

On that basis, and taking into consideration the high standards maintained in your equipment, your molding and melting operations, we should say you are quite justified in insisting that the losses shall be held to 5 per cent or less.

A loss of 5 per cent is considered to reflect good practice in general jobbing shops where a miscellaneous line of castings introduces to an unusual degree the hazards incidental to all experiment. This element is eliminated to a considerable extent in foundries specializing in one product and where duplicate castings are produced in a routine manner day after day. It is a matter of common knowledge that the loss in car wheel shops rarely exceeds 2 per cent. Many monthly records show a loss of less than 1 per cent. In a prominent automobile foundry recently the loss on one particular difficult casting was two tenths of 1 per cent while on another perhaps more difficult casting the loss was less than 2 per cent.

Hot Iron Is Needed To Secure Clean, Solid Castings

We are finding dirt and porous spots on ammonia pressure castings for ice machines. Can you suggest a method of preventing these defects in the castings?

Dirty or porous areas in pressure resisting castings—or in any other type of casting—are traceable to faulty molding or melting practice or perhaps to both. The only way to prevent them from appearing is to pour hot clean iron into a clean mold where all gas from core and mold can escape readily.

Assuming that your iron is melted hot and clean the porous areas in the castings are due to one or perhaps two causes (a) Sand washed in from the sprue, gates or from the face of the mold or core (b) ebullition or boiling of the iron when it comes into contact with hard or wet sand, or with a hard, dense core from which the gas cannot escape readily through the proper channels. Loose sand carried in by the stream of iron will travel a certain distance and then cling to the wall of the mold or core to form a porous area in the casting. Boiling iron will solidify in a porous state with the same result. Fluxes of various kinds are employed in metallurgical practice, for example for the control or

elimination of certain elements, but they are not possessed of magical properties that will prevent loose sand from flowing with the metal, or iron from boiling violently when brought into contact with an ill vented core. We are quite sure that if you carefully study and correct your molding and coremaking practice you will have no further trouble.

Several Compositions Available for Mill Bearings

We are interested in obtaining information on the analysis of metal used, and the method of handling sheet mill bearings. We understand that from the handling end, production of the bearings is more or less a specialty.

The alloy generally used for rolling mill bearings contains 80 per cent copper, 10 per cent tin and 10 per cent lead, but many of the mills have their own pet ideas concerning the most suitable composition. We have heard that the 85-5-5-5 alloy also has been used successfully. As far as we know there is nothing special in molding such bearings. The usual practice of casting them with the bearing face down so that a clean surface is obtained, is no different than the ordinary procedure. The pattern leaves its own core, and in such cases where dovetails are desired for holding a white metal face, those are formed by use of drysand cores inserted in slots formed in the green-sand cores.

Size and weight is the determining factor on whether skin drying will be required, but bearings up to 300 and 400 pounds have been made in green sand. In some cases where a fine smooth face is desired, the core is blacked carefully and skin dried. Gating is at one end through a single sprue with two branches entering the mold cavity at the bottoms of the legs forming the inverted U. A good sized riser is taken off the top of the U on the opposite side, and sometimes one is taken off at the gate side.

Absence of Zinc Makes Bronze More Difficult To Cast

We wish to produce a considerable tonnage of bronze castings, analyzing 88 per cent copper, 10 per cent tin, and 2 per cent lead. Due to chemical reaction it is important that the alloy be entirely free of zinc. Is it possible to cast successfully pressure castings such as valves and fittings weighing approximately 10 pounds of this alloy?

The alloy 88 per cent copper, 10 per cent tin, and 2 per cent lead, is not uncommon and while it is a little more difficult to cast than when zinc is present, no trouble should be encountered if the necessary care is taken in the production of the castings.

Of course, that alloy is more sensitive to improper melting practice and consequently if it is melted in an atmosphere where gassing may occur, soundness of the castings will be affected in proportion to the amount of gas absorbed. The metal should be melted rapidly and preferably deoxidized with a little phosphor copper. About 2-pounds of 10 per cent phosphor copper to 100 pounds of metal should be ample, and if this is not effective, the trouble should be located.

In molding, the same precautions should be observed that are common to the other bronzes and proper risers should be provided to insure satisfactory feeding of heavy sections. The proper pouring temperature easily can be determined by experience. In general, if the metal has been melted properly, it should be poured at as low a temperature as readily will run the castings and fill the risers with fluid metal. Cores should be open and freely vented and preferably coated with a good graphite coating.

We cannot emphasize too strongly the necessity for care in melting and the desirability of having melting take place as rapidly as possible. As soon as the metal is at the proper pouring temperature, it should be withdrawn from the furnace and poured and not allowed to remain in the furnace any longer than is absolutely necessary. That is because the time element is so important in melting nonferrous metals, and the longer the metal remains in the furnace the greater the possibility of gas absorption. With gassy metal it is impossible to obtain sound castings.

Large silent chain sprocket wheel recently made by the Morse Chain Co., Ithaca, N. Y. The casting weighs over 10 tons and is 131 inches in diameter

Gives Analysis of Nickel Babbitt Alloy

Will you please tell what metals are contained in best grade nickel-babbitt?

Most nickel babbitts contain about 0.5 per cent nickel, although some sold under that designation do not contain any nickel at all. A few other tin base alloys may contain 3 to 5.5 per cent nickel such as Ashberry and Trabuk metal.

A representative nickel-babbitt will have the following composition; Copper, 4 per cent; nickel, 0.5 per cent; antimony, 10 per cent; and tin, 85.5 per cent.

Method of making is to melt 4 pounds of copper and ½-pound of nickel covered with charcoal in a crucible. When molten add 10 pounds of antimony. Then add 14.5 pounds of tin and stir well. This forms an alloy or hardener which is soluble easily in the remaining tin.

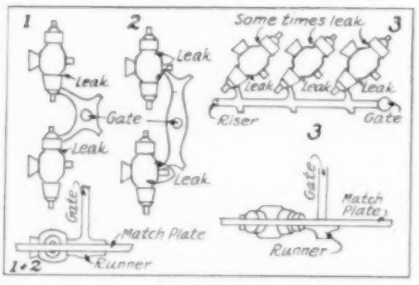
Leaks Are Caused By Shrinkage of Metal

We have been manufacturing corporation cocks for some time and with good success, made up of 76 per cent copper, 2 per cent tin, 16 per cent zinc and 6 per cent lead. After reading an article in THE FOUNDRY we decided to try a mixture containing 85 per cent copper, 5 per cent tin, 5 per cent lead, and 5 per cent zinc. Also, we tried a mixture comprised of 85 per cent copper, 6 per cent zinc, 5 per cent lead, and 4 per cent tin. We found, in using the latter two mixtures, that the machining was much better and the castings had a much better appearance, but we also found quite a large proportion of these castings had soft spots and leaked. We then changed our method of gating and changed the melting heat, tried ingot metal, also mixing our own mixture, but all to no purpose; the proportion of leaks not being any less.

The metal is melted in crucibles in a gas fired furnace, and the temperature is determined with a pyrometer which has been checked for accuracy. We have tried pouring from 1800 to 2000 degrees Fahr., but that had little or no effect on the proportion of leakers. We melt the copper, then pour in the zinc, lead and tin, and add about 4 ounces of phosphor-copper per 100 pounds. We also have tried melting one-third borings and gates, and then adding the copper, zinc, lead and tin.

Tendency to leak in the corporation cocks evidently is caused by shrinkage and can easily be proven by the fracture of a defective casting at the point where the leak occurs. Examination of that fracture will indicate if it is a shrink or whether dross concentrates at these points and causes leakage.

We believe, that your trouble is purely that of shrinkage. This can be corrected by gating the castings



Gates should be located on both sides of the core so that the metal does not have to run around and fold over

so as to reduce shrinkage to a minimum. A little experiment will indicate the most desirable method. Without dimensions and wall thicknesses to guide us, the most logical method would be to follow the gating you have marked as I and II, except that the gates should be located on both sides of the core, so that the metal does not have to run around under the cores and fold over the core and back again to the point where the gate is now located. This causes the cold metal to be carried to the top of the core where it finally spills over the rounding surface of the core and tends to reduce the temperature at the point where the two streams of metal rising on either side of the core unite.

It is possible that you will have to reduce the thickness of the gate from that shown when you put a gate on either side of the cores; but without knowing what the wall thicknesses are, it is impossible to state definitely. With proper gating, these castings should be made in any of the regular alloys equally successful with a minimum of leakers.

Clean Stoveplate Castings by Tumbling

We are interested in a good method to clean and polish stoveplate castings such as cross T and lids for coal stoves. We have no sandblast equipment in our plant, but have a battery of different sized tumblers that could be equipped for the work.

Stoveplate castings such as you mention may be cleaned in tumbling mills. It is necessary to pack the work in carefully so that no breakage will occur as the castings are fragile. Tumbling barrel stars are used to obtain the required cleaning and polishing action on the various castings.

Castings Resist Extra High Temperatures

We shall appreciate your advice on the most suitable iron for cement kilns nose rings exposed to a temperature of 2000 degrees Fahr. The castings are semicircular about 50 inches in length and 10 inches wide, average thickness 2 inches, estimated weight 250 to 300 pounds each.

Since cast iron of various compositions melts at temperatures between 2000 and 2300 degrees Fahr., we doubt if any of these castings will give your customer satisfactory service if he is correct in his claim that they will be exposed to a constant temperature of 2000 degrees Fahr. He should use steel castings. However, it is possible that he overestimates the temperature and in that case an iron with all or nearly all the carbon in the combined state will yield reasonably satisfactory service.

Additions of nickel and chromium increase the life of the castings. A typical mixture would show: Silicon 0.80 per cent, manganese 0.70 per cent, sulphur 0.10 per cent, phosphorus 0.20 per cent, nickel 1.25 per cent and chromium 0.70 per cent.

All irons grow under the influence of heat and soft irons grow to a greater extent than hard irons. For that reason spaces should be left between the ends of the ring sections. In this connection also it is pertinent to point out that ring sections warp, and naturally long sections warp to a greater extent than short sections. Consequently a large number of short sections will serve more satisfactorily than a small number of long sections. Also short sections are more convenient to replace and possibly the wear may be confined to one section.

Obtain Special Analysis from Buyer

We have been asked to make some bronze impellor castings of Reeves No. 1 acid resisting bronze. Can you give us the analysis of that metal?

Formulas for special bronzes required by many people are not published regularly. Since many of these special named bronzes are changed from time to time, it is necessary to get the latest specification to be sure that these requirements are being met. Therefore, we believe that the best method of securing the required specifications for this alloy is to get them from the customer who has specified this alloy.

The alloy 80 per cent copper, 10 per cent tin, 10 per cent lead has been advertised as acid resisting as have many other alloys made up of copper, tin and lead without appreciable quantities of zinc. The analysis you have asked for is not published.

Viewing Foundry Developments

At Short Range

A ROUND tumbling barrel fully loaded is said to require 1 horsepower for each 6 cubic feet of tumbling volume, while a square mill, fully loaded will require 1 horsepower for each 8 cubic feet of tumbling volume. When the mill is loaded only ¾ full, four times the horsepower is required for operation.

♦ ♦ ♦

Cast alloy iron brake drums used on the Ford car have been provided with an additional number of cooling ribs. Total braking area is 186 square inches.

♦ ♦ ♦

ORE chutes of nickel-chromium cast iron have shown an operating life three times that of the unalloyed material. Staver Foundry, Virginia, Minn., casts chill plates for chute liners, the iron having the following composition: Total carbon, 3.30 per cent; silicon, 1.20 per cent; manganese, 0.60 per cent; sulphur, 0.10 per cent; nickel, 2.00 per cent; and chromium, 1.00 per cent.

♦ ♦ ♦

Experiments conducted by a manufacturer of die castings showed that by using pots made from electric furnace iron, 25 per cent or 100 pounds could be saved in the weight of the pot. Life of the pot was 160 heats as compared with 65 with cupola melted iron.

♦ ♦ ♦

Metal castings with an integral face of abrasive material may be obtained by first spraying the mold face with graphite and molasses water or clay in water, according to a recent patent. Then the abrasive material is sprayed onto the coating so that its back surface remains exposed. The molten iron then is poured into the mold cavity, and it fills the minute interstices, holding the abrasive tightly in place. While not specified, presumably the inventor dries his mold before pouring.

♦ ♦ ♦

In the pattern storage department of the steel foundry the smaller pattern plates are suspended from hooks attached to horizontal pipe lengths. It is claimed this is an improvement on the usual method where these plates are packed either flat or on edge on shelves. The pipes do not take up as much room as the usual racks and shelves and the plates do not become distorted. One end of an S-hook is thrown over the pipe and the other end of the hook is inserted in the pin hole of the plate.

♦ ♦ ♦

TWO 400-watt heaters of the swaged tube type formed to fit into the flat wells of a pattern jig are used by the Crane Co., Chicago, on its patterns to prevent the sand from sticking to the pattern plate.

♦ ♦ ♦

An alloy introduced by High Duty Alloys, Ltd., England, for such parts as fast-moving levers, treadles and brackets in the textile and electrical industries, and for the smaller forms of castings in the aircraft industry, analyzes as follows: Copper 2.5 per cent; nickel 1.5 per cent magnesium 0.8 per cent; iron 1.2 per cent; silicon 1.2 per cent; and aluminum remainder.

♦ ♦ ♦

Production of an adherent patina on copper and copper base alloys can be obtained electrolytically in a solution containing 5 to 8 per cent sodium bicarbonate with a current density from 1½ to 18 amperes per square centimeter. In the patent a preference for a current density from 1½ to 4 amperes is cited. One method of applying the solution is to use a metal roller covered with cloth saturated with the soda solution as the cathode, and the metal to be coated as the anode.

♦ ♦ ♦

A NICKEL silver alloy which is especially suitable for ornamental castings has the following composition: Copper 62.00 per cent; tin 5.50 per cent; lead 3.00 per cent; nickel 17.50 per cent; and zinc 12.00 per cent.

♦ ♦ ♦

One of the developments to supply preheated air to the cupola is revealed in a patent just granted. The inventor uses long tubes located around the inside diameter but not touching the lining or each other. They are placed below the charging door, and extend not more than 2 feet below the upper level of the melting zone. The tubes have a radial width from 1/14 to 1/56 of the cupola diameter, preferably 1/28.

Index Is Ready

AN INDEX of all articles published in THE FOUNDRY during 1934 and giving a complete reference and cross reference to the material which has appeared in each of the issues, has been prepared for distribution. Readers who bind or preserve the back issues of this publication will find the index of great value in referring to articles which have been published. A copy of the index will be mailed free of charge to any subscriber who requests it from THE FOUNDRY, Circulation Department, Penton Building, Cleveland.

The FOUNDRY Family Photograph Album

Upper Left

W. E. CLOW,
James B. Clow & Sons,
Chicago

Upper Right

J. G. GOLDIE,
Cleveland Trade School,
Cleveland

Lower Left

H. B. PARKER,
Albion Malleable Iron Co.,
Albion, Mich.

Lower Right

C. H. LEHMAN,
Blaw-Knox Co.,
Pittsburgh

Men of Industry

Whose Activities Are Making Foundry History

WALTER L. SEELBACH, secretary and treasurer, Forest City Foundries Co., Cleveland, was elected a director of the American Foundrymen's association recently. Mr.

Walter L. Seelbach

Seelbach has been active in the foundry industry for many years, and has taken a prominent part in several technical and trade organizations. He is a past president of the Ohio Foundrymen's association, a past president and one of the organizers of the Gray Iron Institute, now the Gray Iron Founders society.

Mr. Seelbach was educated in Cleveland and graduated from Case School of Applied Science with a degree in civil engineering. He has been associated with the Walworth Run division of the Forest City Foundries Co. since 1910.

❖ ❖ ❖

John L. Campbell has been appointed manager of roll sales for the Ohio Steel Foundry Co., Lima, O. He has been active in roll sales since July, 1933, having formerly been associated with the Hubbard division of Continental Roll & Steel Foundry Co. In his new position he will have charge of sales of steel, alloy steel and iron rolls manufactured at Lima and Springfield, O., plants of the company.

❖ ❖ ❖

B. A. YATES, metallurgist with McQuay-Norris Mfg. Co. since 1927, has transferred from Connersville, Ind. to the St. Louis plant.

❖ ❖ ❖

DR. LILLIAN MOLLER GILBRETH, consulting engineer in management, has been appointed professor of management at Purdue university, Lafayette, Ind.

❖ ❖ ❖

E. L. MCNAMARA, roll salesman in the Youngstown district since 1928 for United Engineering & Foundry Co., Pittsburgh, recently was promoted to assistant managership of roll and steel castings for the United company with headquarters in Youngstown, O.

❖ ❖ ❖

JAMES L. WICK recently was re-elected president of the Falcon Bronze Co., Youngstown, O. Other officers were re-elected as follows: Vice president, R. H. Doeright; secretary, John Noll; treasurer and counsel, E. E. Miller; and director, C. H. Kennedy.

❖ ❖ ❖

GEORGE W. THORNBURG, Crescent Park Brass Foundry, Waltham, Mass., who assumed the presidency of the New England Foundrymen's association Jan. 9, has been active in association work for 20 years. He was president of the Associated Brass Founders of New England for 3 years before it was affiliated with the New England Foundrymen's association. Following the merger two years ago he was elected to the executive board of the New England group and served in that capacity until his recent election as president.

Mr. Thornburg has been connected with most branches of the foundry industry, including gray iron, steel and nonferrous. Previous to entering the brass foundry field, in which he has been engaged for 20 years, he was with the United States arsenal, Watertown, Mass. He took over the Crescent Park Brass Foundry after leaving the arsenal. Earlier connections included the Davis & Farnum Co., Waltham, where he made the large castings for the Boston Ele-

George W. Thornburg

vated railroad power plants and those used in the 40,000,000-gallon pumping station, Lynn, Mass. He was a member of the board of aldermen, Waltham, Mass., for 7 years, serving 3 years as president of that board.

Chapter Announces Lectures on Spectroscope

Detroit chapter of the American Society for Metals will hold the second series of lectures in its educational program starting Feb. 18. Dr. E. J. Martin, electrical division, General Motors Corp., research division, will give the lecture which will be devoted to the spectroscope and its use in metallurgical analysis. Subject and dates are as follows: Feb. 18, "Instruments Used for Carrying on Spectrographic Analysis"; Feb. 25, "Qualitative Analysis"; March 4, "Quantitative Analysis"; March 18 and 25, "Various Methods of Photographing Line Intensity". Lectures will be held at Wayne university, 4841 Cass avenue.

Reader's Comment

Interesting communications from readers of The Foundry

EDITOR'S NOTE — *Material Appearing Under this Head Does Not Necessarily Reflect the Opinion of* THE FOUNDRY *or of Its Editors.*

Baked Sand

TO THE EDITORS:

Your January 1935 issue contains the first section of an article taken from my paper presented last year at the A.F.A. convention on "The Function of the Steel Foundry Foreman in Preventing Porosity." My paper contained one sentence which you have converted into two sentences, near the bottom of the middle column on page 52. This change in sentence construction might cause some persons to wonder at and disagree sharply with my opinion regarding an important matter, if your article is read hastily.

The original sentence, which cannot be misunderstood, reads thus:

"Possibly some consumers would say that one obvious solution of this problem is to use among other expedients no mold materials that contain gas-forming constituents that can be discarded; and that therefore green sand should be prohibited for the manufacture of steel castings desired to be practically or entirely free from porosity."

I do not want anyone to think that the author ever said in substance or believed that baked sand always should be used for making steel castings desired to be practically free from porosity. Consequently I would appreciate publication of this letter in an early issue of THE FOUNDRY.

Yours very truly,

R. A. BULL

541 *Diversey Parkway*
Chicago.

Cause of Tin Sweat

TO THE EDITORS:

On page 33 of the January issue of THE FOUNDRY appears an answer to a question relative to tin sweat. I would like to point out that the cure for tin sweat suggested in this reply is a cure for the symptom of the disease rather than a cure for the disease itself.

Tin sweat arises from the presence of gases in the molten metal, which upon solidification of the metal, are released. During the passage of the gases out of the metal, passageways are opened through which the low melting point constituents, described in the reply, pass out to the surface of the casting or the surface of the risers. Consequently, to correct the difficulty caused by tin sweat, it is necessary to correct the condition that caused the dissolved gases.

This is corrected by the elimination of under burnt gases in the furnace atmosphere, since under burnt gases are those that are soluble in the molten metal. It generally is understood that completely burnt or completely oxidized gases are not soluble and, therefore, an atmosphere that has a sufficient amount of oxygen present to burn completely all the gases prevents their being dissolved, and in turn produces metal that does not develop tin sweat.

Metal that has been properly melted may be poured at any temperature desired to produce satisfactory castings and yet no tin sweat will develop. Therefore, the suggestion presented in the January issue to the effect that the pouring temperature be reduced is not a cure for the trouble, but merely a means of compensating to a small extent for bad practice.

I am bringing this to your attention because it seems regrettable that the question gave only partial information when the full information is available.

A Metallurgist

Is There a Shortage?

TO THE EDITORS:

We read and hear much these days concerning an impending shortage of skilled mechanics. Such nonsense can only cause one to remember the gay party to which the guests looked forward, but which turned out to be a gathering of valedictorians with their joy killing babbling. Business recovery undoubtedly will be much slower than the approach of the depression, hence such skill as may be required in the present specialized nation can be produced as needed.

However, a time is coming when employers cannot hire help for a pittance. That is what I believe some really see and call it shortage of skilled mechanics.

When business was rolling on the top wave of prosperity, carried along on its own momentum, the great leaders got all the credit. Where are they today? A certain shipyard working on navy contracts has a crew of about 65 welders, real welders. As many more are in the vicinity and available if needed. To increase the staff the company hired about 75 young men as apprentices. Not for the purpose of eventually paying them welders wages, but for the purpose of reducing the wages of the real welders to that of the apprentices. This is not an isolated instance. The same practice is prevalent throughout the country. The real shortage in this country is not a shortage of skilled help but a shortage of economic and social justice.

ERNEST WALKER

Groton, Conn.

Connecticut Nonferrous Association Meets

Connecticut Nonferrous Foundrymen's association held its regular meeting at the Hotel Garde, New Haven, Jan. 15, with David Tamor, Reading, Pratt & Cady Co., Hartford, Conn., presiding. E. E. Seeley, Bennett & Seeley Co., Bridgeport, led the discussion on "Facings, Dressings and Partings."

A technical committee consisting of Frank Diana and Byron Reid was appointed to keep minutes of technical discussions at the meetings and to compile data sheets for mailing to members.

The next meeting of the association will be held Feb. 19 and will be addressed by L. A. Ward, assistant metallurgist, Chase Brass & Copper Co., Waterbury, Conn., on "Deoxidation & Degasification of Cast Bronze and Brass."

Changes Company Name

Standard Chaplet & Supply Co., Swetland building, Cleveland, has changed its name to the Standard Chaplet Co., in keeping with its line which is devoted exclusively to chaplets. W. A. Cronenberger is manager.

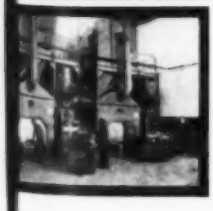
Old Employes Honored

Nine employes of the National Malleable & Steel Castings Co., Cleveland, recently celebrated 476 years in the company's service as banquet guests of that company. The men with more than 50 years service with the company include: Henry F. Pope, William Wahl, Martin Lubinsky, John Bellar, James Moravec, Joseph Blaha, William Luff, Johny Lisy and Frank Vacha.

Walton L. Woody, works manager, was toastmaster.

CHECK YOUR PRESENT PRODUCTION WITH A STOP WATCH

ARE YOU SATISFIED WITH YOUR BLAST CLEANING TIME

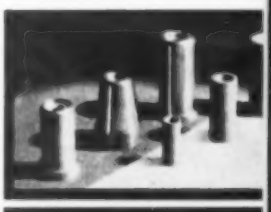


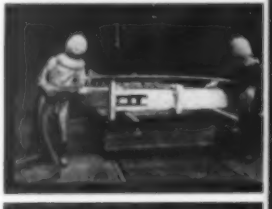
SLOW, inefficient Blast Room equipment is one reason for today's sluggish foundry profits. When cleaning production is slow, cost per minute runs high.

High production cost has no place in modern industry. Design engineers have made such sensational advancement in Pangborn Blast Cleaning equipment that production costs have been lowered beyond all expectations.

Now is the time to investigate the economy of bringing your blast cleaning equipment up to date. Pangborn Rooms, Tables, Barrels and Cabinets are in line with 1935 requirements.

The addition of an improved Pangborn unit such as the "AU-11" Blast Machine, "BVR-5" Abrasive Separator, Self Sealing Doors, Safety Helmet, Steel Abrasives, will greatly lower Blast Cleaning Cost.





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Prevent Losses with

Proper Gates and Risers

By PAT DWYER

ONE factor that constantly must be kept in mind while designing gates for malleable castings—and of course this also applies to every metal—is that the metal constantly is losing temperature and fluidity from the time it leaves the furnace until it solidifies in the mold. Naturally the loss is much more rapid after the metal comes into contact with the sand. Also that the loss is comparatively greater in the small gate than in the large stream from the ladle or in the main sprue. Where 30 tons of iron will flow readily through the tap hole of the furnace, a ladle full of the same iron poured over a sand bed will freeze before it has traveled more than a few feet. Poured into the familiar test spiral approximately ¼-inch in diameter, the distance the metal will run before solidifying is measured in inches. This constant drop in temperature and consequent accelerated tendency to revert from the molten to the solid state is the perennial barrier in the malleable foundryman's race against time and distance.

Problem Becomes Acute

Difficult enough in many instances on single castings, the problem becomes more acute and complex where a large number of castings are gated from a single sprue. The metal is split into a number of small streams and each stream must have sufficient volume and velocity to fill its respective mold cavity before the metal solidifies. Under any condition and in any type of casting, metal must be poured at a reasonable speed to prevent cold shuts or missruns. The danger of this form of defect is not so great where a large or comparatively large volume of metal is present. Therefore—if considered advisable—the metal may be poured slowly, or to some extent, even intermittently. However, no form of dilly-dallying is permissible in pouring the metal into light, thin castings, particularly where a considerable number of these castings are molded in a single flask.

The metal must be exceedingly hot and it must be poured exceedingly fast. The temperature is under the control of the melter, but the trick of fast pouring is part of the technique which must be acquired by the molder. Both factors must be taken into consideration by the investigator seeking the cause of abnormal scrap losses. In some instances the cause may be traced to dull metal, but in others a proper and intelligent investigatfon will show that satisfactory metal has been manipulated improperly.

Test Flow of Metal

In an article on the manufacture of malleable castings, which appeared in THE FOUNDRY several years ago, Enrique Touceda touched upon an interesting experiment tried in connection with solving a specific problem of missrun castings. Small rings were nested, gated together and poured in multiple molds. The loss was confined mostly to two sizes. With a view of following the distribution of the metal, five single molds were short poured. A small amount of iron was poured in the first mold, a little more in the second, a little more in the third and so on to the fifth. In this manner an exact record was secured of the direction and distance the metal flowed from the gates. The runners and gates then were changed to some extent in conformity with the evidence, even though the change violated certain former theories.

(*Continued on page* 45)

Pour Metal Fast

MOLTEN malleable iron loses fluidity rapidly. Many malleable castings are light and thin. Therefore, as a general rule the metal must be poured rapidly and generous size sprues, runners and gates must be provided so that the metal may travel readily to its destination. Large gates and supplementary risers fulfill another important function in supplying feeding metal to compensate for shrinkage, which otherwise will cause cavities, porous areas and sometimes cracks in the castings. Design of the pattern in many instances is an important factor in the ultimate production of solid castings. This applies not only to individual patterns, but also to the spacing arrangement, size and position of gates where a number of patterns are mounted on a board or matchplate. Proper thickness of sand required between patterns depends on the size and more particularly on the depth of the castings.

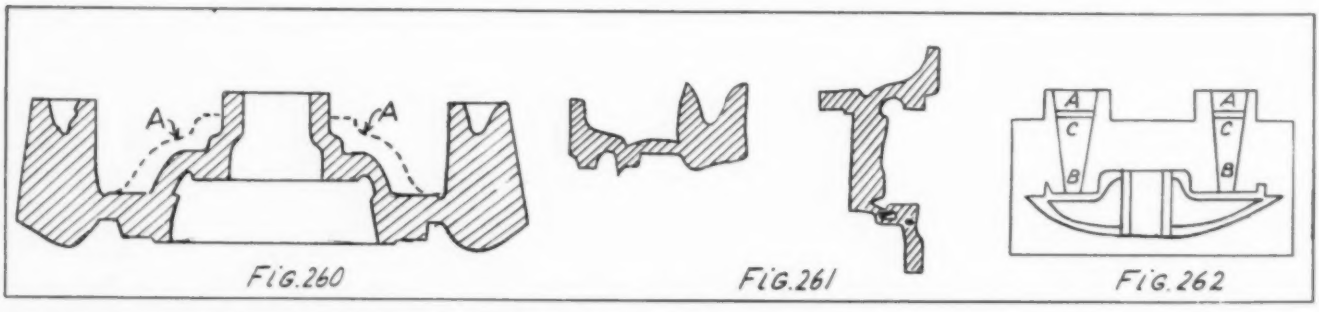

FIG. 260 FIG. 261 FIG. 262

Fig. 260 (Left)—Additional thickness at A facilitates feeding the casting. Fig. 261 (Center)—Unequal section results in cavities. Fig. 262 (Right)—Example of combined gate and feeder

ADVERTISING PAGES REMOVED

(*Continued from page* 42)

In these tests the molds were leveled in two directions and hot iron was poured rapidly. The results indicate the vital necessity of having the gates leading to all patterns on both sides of a central runner exactly of the same shape and area so far as each pair is concerned; the area of the gates of each pair changed in accordance with what is disclosed by the short pouring test, and the runners so tapered that the flow of metal will be more evenly distributed to each individual mold in the flask, to the end that each one will take the metal as rapidly as the others.

The casting shown in Fig. 260 will serve as an example of the manner in which a foundryman occasionally has to manipulate a mold or pattern to secure satisfactory castings. It also serves to illustrate the well known fact that preliminary cooperation by designer and foundryman would have eliminated a great deal of unnecessary work in the foundry.

In this instance the four large risers on the lower flange of the circular casting weigh more than the casting itself, but due to the shape and varying thickness of the metal section in the casting, the full feeding effect of these risers could not be realized. To effect a proper distribution of the metal during the cooling period, four vertical strips or brackets were placed on the pattern extending from a point close to each riser to the upper neck as shown at *A*. In this manner a wide channel through which hot metal might reach the top of the casting is assured. Formation of a shrinkage cavity at the fillet where the small neck expands into the larger body is prevented.

Rounded Corner Avoids Shrink

Even with all these precautions a light shrink occasionally will be found in the section directly opposite the sharp corner. If this corner were rounded, danger of a shrink at this point would be removed.

When placing new patterns of hitherto untried design in the sand, the founder not only should experiment with the pattern until he has satisfied himself through the breaking of the hard iron casting that all shrinkage is absent and that he has developed the best method of gating and heading the casting, but, after he has arrived at this decision he should anneal some of the castings to confirm his conclusions.

Slight porosity is difficult to detect in a hard iron fracture. Frequently upon breaking an annealed casting, which in the hard condition apparently was perfectly sound, evidence of shrinkage is found. In this connection it is interesting to note that the color of the metal in the shrunken section indicates whether the metal was poured hot, medium or

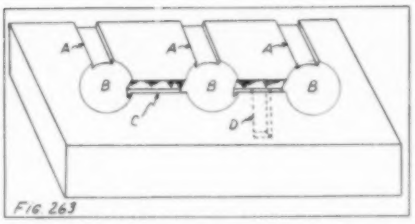

Fig. 263—Gate with shrink bobs in core

cold. When poured very hot the metal is black, poured at a medium temperature it is dark gray, while the shrink resulting from metal poured at a fairly dull temperature is light colored.

Another example of shrinkage due to uneveness of metal section is shown in Fig. 261. The section on the left was cut on a line with the center of the head and through a section of fairly uniform thickness. This part of the casting shows no shrinkage. About 90 degrees from this another section was machined from a part of the casting where the sections are grossly disproportionate.

This particular casting might be gated and headed in almost any manner, with almost any amount of metal in the heads without producing a sound casting. With a little thickening of the narrow neck just above the largest shrink and the removal of some metal from the heavy vertical section to which it is attached the founder would be in position to make a solid casting, provided also some slight modification was made in other sections.

Shrinkage and contraction are the principal factors in the problem with which the mallable foundryman has to contend. This includes not only

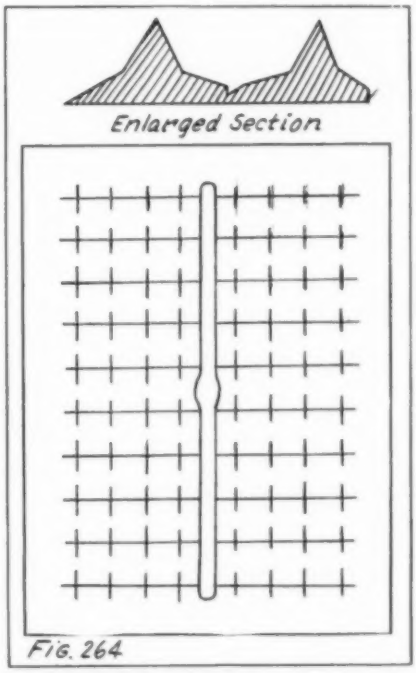

Fig. 264—Layout of hard iron stars on matchplate

the more obvious cracks and large shrinkage cavities, but the concealed and insidious form of defect which is revealed only by a close cross sectional examination. In some instances chills, either internal or external, are employed to equalize the cooling speed of the metal in the thin and thick sections. Manufacture, replacement, preparation and application of the chills increase the molding cost of the castings. If allowed to become damp or rusty they introduce an additional hazard into an already complicated situation. The dampness and rust generate steam and gas which in turn form blowholes in the castings.

In many instances it is possible by a rearrangement of the pattern, or by a special arrangement of the gates to distribute the metal in a manner that will secure a sound casting from a pattern formerly responsible for castings containing defects due to shrinkage or contraction factors. One of these special methods developed in the plant of a prominent manufacturer of electrical machinery is shown in Fig. 261. The metal is poured directly into a large opening which serves for both gate and riser on top of the mold. The type of casting shown in the illustration is made in large numbers and it is claimed that the loss from defective castings has been reduced to a gratifying extent since this method of gating was adopted.

Pouring Riser in Dry Sand

The pouring riser *A* is formed in dry sand inside a light metal ring and is placed on the closed mold over the corresponding large riser formed in the green sand of the cope. A gate core *B* is placed at the lower end of this riser to prevent the metal from cutting the sand at this constricted area where the metal enters the mold. A slight neck on the core facilitates the removal of the riser without danger of damaging the casting. Further precaution in this respect is taken by placing a 5/16-inch pad on the pattern at the point of junction with the bottom end of the riser. The pad varies in size according to the pattern. Where the pattern is large enough the pad may be 3 x 4 inches. The riser is knocked off immediately after the metal has set. A light blow on the top and one or two at the sides insures a clean break.

A strainer core *C* is placed in the bottom of the feed box and not only serves to skim the metal as it falls from the ladle, but after all the metal is poured, the core floats to the top to cover the metal in the feed box and thus prevent it from cooling too quickly. During the pouring period the basin is kept filled nearly to the top. Extra strength to withstand the first fall of metal, is imparted to the strainer core by dipping it in, or spraying it with core oil. For the

(*Concluded on page* 48)

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An exclusive Norton development; a patented feature that means better fitting of wheels to their job and better duplication. The structure of the wheel (the spacing of the grains) is regulated by definite steps, just as are grain and grade, to meet the exact requirements of each job.

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In each district Norton men to help you solve your snagging problems—to help select the best wheel for the job. In Worcester, engineers and laboratory men who specialize on snagging—who devote all their time to solving cleaning room grinding problems.

You'll like Norton Snagging Wheels because they are long lasting; operators like them because they are fast cutting.

NORTON COMPANY
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NORTON
ABRASIVES

(*Concluded from page* 45)

same reason a ram-up dry sand core is bedded in that part of the mold immediately under the combined gate-riser.

An interesting example of molding practice and the application of special gates was developed in a Midwest malleable iron foundry for the production of a fire engine motor crankcase 5½ feet in length and weighing 650 pounds. A total of 57 dry sand cores are placed in the green sand mold for one of these castings. Some of the cores are on the inside and some on the outside of the casting.

In the first attempts the castings were poured from the top, that is a long runner was cut at each side of the joint from which a number of wide, shallow branches conducted the metal into the upper flange. This method while satisfactory as means of distributing the metal rapidly to all parts of the mold, necessitated an excessive amount of work in the cleaning room, besides the attendant risk of breaking the flanges. Another reason why the long runners were abandoned was because they tended to pull the flanges and warp them out of shape.

Poured from Three Ladles

In the later and more satisfactory method the metal is poured from three ladles simultaneously, one at each end and one in the center of one side. The average thickness of metal in the walls of the casting is ¼-inch and it is apparent that the mold must be filled rapidly with exceedingly hot iron to prevent cold shuts. Further, the temperature of the metal in the three ladles must be practically uniform, otherwise shrinkage cracks will develop in the casting and render it worthless. Many factors enter into the successful production of these castings, but it has been found that accurate control of the temperature from beginning to end, from the time the metal enters the mold until the casting leaves the annealing oven, is the most important.

The core that forms the outside wall of the mold on either side is made in several sections to facilitate production and handling. One of the sections for forming the gates is shown in Fig. 263. A flat core is laid in the bottom core print and then two of these runner cores placed in the opposite position to that shown in the illustration. The upright sprue *D* extends to the joint line of the flask where it is connected by a suitable channel to the sprue leading down through the cope. In the core the metal from the sprue *D* enters the horizontal runner *C* leading into the shrink bobs and dirt catches *B* and thence to the gates *A* which conduct it into the mold at points near the bottom.

A contributory factor to the success of the method is that a considerable amount of molding sand is used in the core mixtures to enable the cores to retain their shape while drying. Rosin is used as a binder in the smaller cores, while the larger cores are bonded with a proprietary gum product. Care is exercised to keep the core sand mixture uniform and to use a minimum amount of binder so that the cores may offer minimum resistance to the

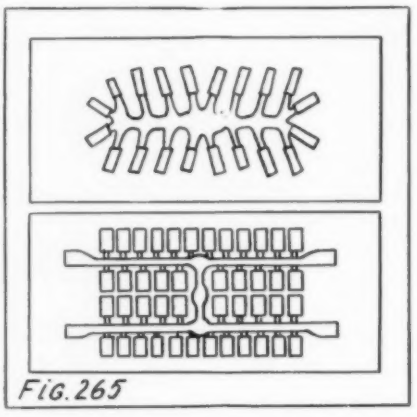

Fig. 265—Showing contrast between careless and proper method of arranging small patterns on pattern board or plate

contraction of the metal. Long, narrow slits in the top face of the body cores form tie rods between the ends and the bearing brackets in casting. These tie rods ½ x ¾-inch help to equalize contraction strains and to prevent distortion of the casting in the mold and later in the annealing oven. They are removed easily in the chipping room.

In contrast to the foregoing, an extremely large casting for malleable iron, it may be of interest to note the extreme simplicity of the gating system adopted for the production of hard iron stars used in tumbling barrels. An improvement on the ordinary matchplate for making these stars is shown in Fig. 264 where 80 star patterns on the plate are arranged in 10 rows with 4 patterns in each row on either side of the long central runner. This arrangement economizes in the total amount of iron required to pour the castings. The only metal wasted—temporarily—is that contained in the sprue and runner. The patterns in each group of four touch each other without any intervening gate metal. When these castings are poured and shaken out they are not broken off the gates singly, but are broken off in clusters of four and thrown into the tumbling barrels in that shape. After one or two revolutions of the barrel they are reduced to single stars.

Another example of pattern spacing illustrating the difference between waste and economy is shown in Fig. 265. Paternmakers and foundrymen accustomed to working with heavy sections or large units, usually are too liberal with the space allowed between small patterns on a board or matchplate. Inexperienced men, or men who have not experimented sufficiently to determine the minimum amount of space required are inclined to play safe on this point by providing plenty of room between the patterns. Naturally the minimum space required will vary to some extent depending on the shape and more particularly on the depth of the casting. A larger body of sand is needed between deep castings, than between those which are shallower.

Spacing arrangement, gating, mold size, etc., are important factors effecting the ultimate cost of the castings. Benefits which should be derived from good patterns easily are lost by disregarding any of these items. In the upper part of Fig. 265 a board is shown with only 20 patterns on it. By a rearrangement of the patterns as shown in the lower part of the illustration 44 patterns are mounted on the same board. Without any extra work on the part of the molder, his output of castings is more than quadrupled in any given period.

This is the sixtieth of a series of articles dealing with the various types of gates and risers used in the foundry industry. The sixty-first installment will appear in an early issue.

THE EDITORS.

Northern Illinois Group Studies Sand

R. K. Akin, research metallurgist, Robert W. Hunt, Co., Chicago, addressed the members of the Northern Illinois Foundrymen's association at a meeting held Jan. 8 at the Elks club, Rockford, Ill. Mr. Akin spoke on "Foundry Sand Control." He described sand control as a mechanical means of determining the various factors involved in the production of castings which must meet the increasingly exacting modern demands. The practical molder has been skeptical of this method, but the advent of less skilled men has made establishment of definite sand standards imperative.

Mr. Akin pointed out that time necessarily must be given for the establishment of these standards, which include clay content, moisture, permeability, strength (compression, tensile, and shear), flowability, mold hardness, and grain hardness (before and after mulling). The sand control department, having determined the standards, should be the sole judge of the availability of the sand for the job. According to Mr. Akin, the proper selection of sand should bring about the reduction of scrap to a minimum and a lessening of cleaning costs.

New...A SCIENTIFIC MIXER *for Foundry Sand*

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- Proven Design
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- Fluffy Aerated Mix
- Less Mixing Time
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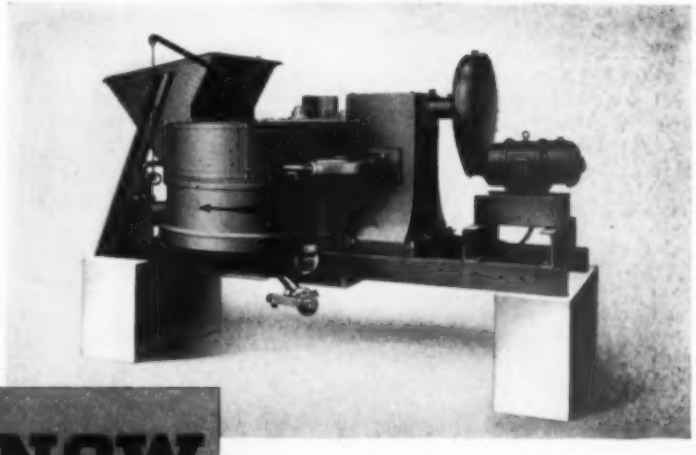
- Many Stock Sizes

THE superiority of their design demonstrated in scores of difficult installations—Bartlett-Snow offers to foundrymen—the Lancaster Mixer... a proven product.

In the Lancaster—mixing technique reaches its greatest development. The pan turning slowly carries the ingredients to the mixing area where plows and mullers whirling rapidly in counter direction insure thorough dispersement. The materials are mulled gently in passing outward, then kneaded and aerated and passed to the plows again in a continuous cycle.

Mixing time is greatly reduced. A light, fluffy aerated mix is secured. Grinding, packing and flaking are eliminated. Microscopic tests show that the granular structure of the sand is unaltered. Six standard sizes of open and closed (dust-tight) designs fit any requirement. Full details on request—The C. O. Bartlett & Snow Company, 6201 Harvard Avenue, Cleveland, Ohio. In New York, 30 Church Street. In Chicago, First National Bank Building.



BARTLETT-SNOW *Lancaster Mixers*

SHAKEOUTS, SCREENS, BUCKET ELEVATORS, AERATORS, DRYERS, BINS, HOPPERS, PUG MILLS, PULVERIZERS, CORE OVENS AND GATES
BELT, APRON, SCREW, FLIGHT, CHAIN AND ROLLER CONVEYORS
COMPLETE SAND HANDLING AND RE-CONDITIONING SYSTEMS

This diagram illustrates the new —the scientific method of preparing foundry sand. Pan rotates clockwise carrying the materials to plows and mullers that spin rapidly in counter direction. "Dead spots" are eliminated. Write for full details.

Rosin in Mixture Prevents Cracks in Sleeve

By W. L. Rose

Thin malleable iron castings containing dry and sand cores sometimes develop cracks before they are shaken out of the sand and the blame is placed on hard cores. The foundryman in many instances is at a loss to determine whether the core was too hard before it was placed in the mold, or, simply retained its hardness after it was surrounded by metal. Anticipating the latter condition, hard cores usually are constructed in a manner that will permit them to collapse to some extent and thus permit the metal to contract normally. Where this factor is overlooked, the blame for the cracked casting mistakenly may be attributed to the molding practice or to perfectly satisfactory metal.

So called soft cores may become hard in the casting at a time when they should be in a yielding condition. Resistance of the core causes the metal to tear and produce what is known in the foundry as a *hot crack*. Investigation of the core sand mixture will show that it contains no collapsing element.

A certain amount of rosin in the core sand mixture imparts the necessary degree of hardness to the cores after they have been dried and cooled. However, the important point is that rosins softens when the core is heated by the surrounding metal and thus the core yields the necessary amount under the contracting pressure of the metal. Other components in the core have the necessary binding and refractory qualities to enable the core to retain its shape.

A satisfactory mixture for cores used in light malleable castings contains 45 shovels lake sand; 3½ gallons cereal binder; 4½ shovels rosin and 1 pint core oil. Since a shovelfull of sand may vary in content the mixture may be measured in gallons: 112 gallons lake sand; 3½ gallons cereal binder; 6 gallons rosin and 1 pint core oil. On a percentage base the mixture would read: 92 per cent sand; 3 per cent cereal binder 5 per cent rosin and 0.01 per cent core oil. The mixture is mulled for 6 minutes and the cores are baked slowly. The rosin is in the form of dust.

To Handle Sales

Ralph H. Clore has been appointed general sales manager, Medart Co., St. Louis, Mo., manufacturers of power transmission machinery. Mr. Clore formerly was general sales manager of the United States Eletrical Tool Co.

F. P. Kohlbry formerly sales manager of the Medart Co., has resigned to take charge of the Machinery & Welder Corp. of Chicago.

Institute To Meet

The annual general meeting of the British Institute of Metals will be held in London, Wednesday and Thursday, March 6 and 7.

The institute's twenty-seventh annual autumn meeting will be held in Newcastle-on-Tyne, Sept. 9 to 12.

Symbols Picture Properties of Alloys

International Nickel Co. Inc., New York, has developed a symbolic display for indicating various properties of nickel alloys. The symbols as adopted by the company, are shown in the accompanying illustration. A background of the symbols was utilized effectively in a display of that company at the Philadelphia convention and exhibition of the American Foundrymen's association.

These symbols are being used by the International Nickel Co. to show the properties of nickel and its alloys

Defends Open Price Reporting Plan

(*Concluded from page* 21)

the code of fair competition for the steel casting industry, have been in connection with contracts with federal, state, municipal and other government agencies. This arises largely out of the fact that such agencies insist upon lump-sum prices. . . . . Governmental agencies will not accept a bid on a per pound price only, nor will they consider a lump sum price figured on the basis of a per pound price multiplied by the estimated weight, subject to a corrected price for billing at the actual weight determined after the castings have been produced. They insist upon a lump sum price that shall be final. This means that the members of the industry must make an estimate of the weight and use this in figuring their lump sum prices for bidding. In countless situations it develops subsequently that mistakes have been made in estimating the weights, which means that the governmental agencies have purchased the castings at less than a fair and reasonable price, and in many cases less than the actual cost of production. Furthermore, a golden opportunity is provided for the chiseler to underestimate his weights deliberately so as to be in a more favorable position to secure the award. The open price plan under a code offers a weapon against such abuses for frequently they can be established as definite violations of the code."

It is pointed out emphatically that industry without some stabilizing influence upon prices will be unable to support their labor obligations under codes. Of this the Steel Founders' society says:

"Many industries without the stabilizing effect of the open price plan with a waiting period could not support the labor provisions in their codes. That probably would be the case with the steel casting industry. In common with most of the durable good group, it has suffered acutely from the burden of the depression. From a volume in excess of $200,000,000 in 1929, its sales dropped to little more than $25,000,000 in 1932, when it operated at 10 per cent of capacity with an average loss of approximately $50 on every ton of castings produced during that year. Gradual improvement has been noted, but even today the ratio of operations is less than 20 per cent of capacity and the industry as a whole is in the red. . . . .

"Without some compensating factor in the way of a legitimate stabilization of prices, it is improbable that the steel casting industry could support the wage structure and other labor provisions of its code. Many other industries would undoubtedly find themselves in the same position.

ADVERTISING PAGES REMOVED

Plan Joint Meeting On Progress in Castings

Chicago section of the American Foundrymen's association, the Western Society of Engineers, and the Chicago section of the American Society of Mechanical Engineers are sponsoring a joint meeting on "Engineering Uses of Modern Cast Metals" to be held March 18 in the Engineering building, 205 West Wacker drive, Chicago.

Advances in gray iron will be discussed by H. Bornstein, chief chemist and metallurgist, Deere & Co., Moline, Ill.; progress in malleable iron will be outlined by D. P. Forbes, president and general manager, Gunite Foundries Corp., Rockford, Ill.; and developments in the cast steel field will be told by A. N. Connarroe, metallurgist, National Malleable & Steel Castings Co., Melrose Park, Ill.

An exhibit showing the developments in foundry technique, physical properties and special applications of cast ferrous metals will be held in conjunction with the meeting. The joint committee is under the chairmanship of A. M. Houser Jr., Crane Co. Chicago. Representatives of the various societies on the committee are as follows: R. D. Brizzolara, American Steel Foundries, and F. B. Orr, Illinois Maintenance Co., for the Chicago section of the A. S. M. E.; A. M. Houser Jr., Crane Co. and W. D. Kinsey, Cleveland Worm & Gear Co., for the Western Society of Engineers; and C. B. Schneible, American Foundry Equipment Co., and E. K. Smith, Electro Metallurgical Co. for the Chicago section of the A. F. A. Mr. Schneible is chairman of the exhibit committee.

A. F. A. Board Names Executive Committee

Board of directors of the American Foundrymen's association, at a meeting held recently in Cleveland, elected the following members to the executive committee: President Dan M. Avey, THE FOUNDRY, Cleveland; vice president B. H. Johnson, R. D. Wood & Co., Florence, N. J.; executive secretary C. E. Hoyt, Chicago; and directors H. Bornstein, Deere & Co., Moline, Ill.; R. J. Teetor, Cadillac Malleable Iron Co., Cadillac, Mich.; James L. Wick Jr., Falcon Bronze Co., Youngstown, O., and Frank J. Lanahan, Fort Pitt Malleable Iron Co., Pittsburgh, Pa.

Walter L. Seelbach, Forest City Foundries Co., Cleveland, was elected a director of the board to fill a vacancy created by the resignation of A. E. Harrison, whose retirement as general superintendent of foundries and patternshops of the Allis-Chalmers Mfg. Co., Milwaukee, was announced in THE FOUNDRY for January.

Heat Treating Steel Castings

(*Concluded from page* 23)

ness at points of wearing contact and yet permits machining where necessary after treatment and obviates the necessity of finish grinding.

Fig. 3—Cast steel boom swing pinion for power shovel

Fig. 4—Cast steel spur gear for rolling mill service

Fig. 5—Bevel gear rolling mill conveyor table

Detroit Group Hears Nonferrous Discussion

H. M. St. John, chief metallurgist, Detroit Lubricator Co., Detroit, gave a practical and interesting talk on "Nonferrous Casting Practice," at the regular meeting of the Detroit Foundrymen's association held at the Savoyard club, Detroit, Jan. 17. President Harry Rayner presided. Considerable discussion followed the talk by Mr. St. John.

Two reels of pictures entitled "From the Mine to the Consumer" and "The Story of Anaconda" were presented through the courtesy of American Brass Co.

The next meeting, to be held Feb. 21, will feature a talk by Rex Jennings, Ecorse Foundry Co., Ecorse, Mich., on "The Use of Alloys in Cast Iron." J. D. Stoddard, Detroit Testing Laboratory, will lead the discussion.

A. S. T. M. Publishes Index to Standards

American Society for Testing Materials, 260 South Broad street, Philadelphia, recently has published an "Index to A.S.T.M. Standards and Tentative Standards", which includes reference to specifications, methods of testing, recommended practices, definition of terms, charts and tables.

The 491 A.S.T.M. Standards and the 241 tentative standards in effect on Jan. 1, 1935, have been indexed under appropriate key words according to the materials or subjects to which they apply. The items under each subject are arranged alphabetically according to the significant word in the title to facilitate finding the item desired.

Book Review

The Foundry, by Albert Halper, cloth, 499 pages, published by the Viking Press, New York.

Those in the metalworking industries anticipating a stirring story based on the romance found in the casting of metals will be disappointed. This novel has a rather misleading title, for it deals with an electrotype "foundry," where metal reproductions are made by the electrolytic process for the printing industry.

Atmosphere for the story is provided from the actual experience of the author, as a shipping clerk in a Chicago electrotype plant. The author has written about people, but it seems that he has made a special effort to bring into the foreground all of the sordid details in the lives of the various characters.

The foundry industry, as it is universally known, will regret the choice of title for this work.

Stressing Interest of Buyers

(*Concluded from page 24*)

Other industries by training average men achieve consistent results without enticing super talent from other fields. A dental supply house had 90 per cent of its newly hired salesmen quit after 3 weeks. Then they hired a man to develop a sales talk. He wrote the truth and made it compelling. New salesmen were not allowed to go out until they memorized that talk. Some stuttered and halted when they told it. Others forgot it and became embarrassed, but sales jumped from 2 to 14 a week per man.

A foundryman in Ohio has six salesmen who were trained in that manner. They are consistent producers. That foundry sends three men into the Atlantic Seaboard and to New England. They close new accounts on the second and third call and come back with orders like a crew of specialty salesmen. They get more money than the local founders, who don't believe it, and ship f.o.b. foundry.

A Chicago foundryman, who believes that the right combination of effective appeals which makes sales once, will make them again and again, tried out a presentation himself, and then gave it to his men. They are now going into Milwaukee, a hotbed of competition, and are consistently procuring accounts at the higher price levels his foundry requires.

Aggressiveness vs. Smugness

The successful salesman has courage in applying the method of presenting the buyers advantage. He has assurance that for every good account obtained, there are a dozen more in the woods. After a meeting in Philadelphia, six foundrymen stated, "I have every worth while casting account in this town on my books. I couldn't sell the others except at a loss." At least five of them were badly mistaken, because the writer knows of three Connecticut foundries that ship tons of fine castings into Philadelphia at prices any local founder would eagerly accept.

Don't imagine that there is no market in any town for anything but the cheapest castings. The notion has been exploded so high and so often that it doesn't classify as opinion. It is hysteria and teams up with pink elephants.

Of course, each jobbing foundry, must anchor its own selling plan into the solid rock of available production facilities. A machine shop foreman sometimes is willing to confess that his costs vary as much as 20 per cent from day to day, that shop loss tickets keep them in constant discord with other departments, and other grievances.

Some foundries find it advisable to offer a free cost survey. On the first visit in reply to an invitation, the salesman makes no attempt to sell. After finding out how many holes the machine shop must tap and drill per hour and annotating the cost of all machining, annealing, finishing, and assembling, he takes sample castings and patterns back with him. He goes over the problem with every key man in his own shop and with outside machinists. Two out of five such check-ups uncover cost leaks which improved castings can remedy. The salesman then reports back with conservative, downward revisions of cost estimates. A major percentage of these estimates are substantiated and result in permanent transfer of the account.

The methods suggested are not new. They have worked for industrial sellers since the dawn of the machine age. By bridging the gap between a constantly improved casting and a static salesmanship, it will obtain for the progressive foundry the higher price levels promised, but so far inadequately attained by less routine and conventional approaches.

Officers Elected By New England Group

The thirty-ninth anniversary meeting of the New England Foundrymen's association was held at the Engineers club, Boston, Jan. 9, with Fred Shaw, president, presiding. Entertainment for the evening was provided by the entertainment committee, of which Charles A. Reed, Rogers-Brown-Lavino Co., Cambridge, Mass., is chairman. Over 100 members and guests were present.

Officers for the coming year were elected as follows: President, George W. Thornburg, Crescent Park Brass Foundry, Waltham, Mass..; vice president, A. S. Wright, Hunt-Spiller Mfg. Corp., Boston; treasurer, Arthur W. Gibby, Gibby Foundry Co., E. Boston; secretary, Ernest F. Stockwell, Barbour-Stockwell Co., Cambridge, Mass.; executive committee, Walter M. Saunders Jr., Providence, R. I., Thomas Curtin, Waltham Foundry Co., Waltham, Mass., Henry Jensen, General Electric Co., Lynn, Mass., A. J. Davis, Freemont Casting Co., Worcester, Mass., and Charles A. Reed, Rogers-Brown-Lavino Co., Cambridge.

The president appointed a special committee consisting of E. H. Ballard, General Electric Co., Lynn, Mass., A. B. Root Jr., Hunt-Spiller Mfg. Corp., Boston, and George P. Aborn, Harvard Trust Co., Cambridge, Mass., to draft suitable resolutions anent the death of Fred F. Stockwell, for many years secretary of the association.

Pittsburgh Group Hears Talk on Iron

John F. Culp Jr., metallurgical engineer, the Vulcan Iron Works, Wilkes Barre, Pa., spoke before a dinner meeting of the Pittsburgh Foundrymen's association held at the Fort Pitt hotel, Pittsburgh, Jan. 21. Mr. Culp spoke on "Practical Iron Foundry Metallurgy and the Foundry of Tomorrow". Immediately following the dinner, O. Nadolny, Duquesne Pattern & Bronze Co., Pittsburgh, presented a motion picture showing some of his recent hunting exploits.

Equipment Group Elects New Officers

At the annual meeting of the Foundry Equipment Manufacturers association held in Cleveland, Tuesday, February 5, new directors were chosen as follows: B. C. Trueblood, Arcade Mfg. Co., Freeport, Ill.; O. C. Sabin, Steel Blast Abrasives Co., Cleveland; and H. S. Simpson, National Engineering Co., Chicago. The board elected F. R. Wallace, Tabor Mfg. Co., Philadelphia, as president and R. S. Hammond, Whiting Corp., Harvey, Ill., vice president. The board and officers of the association also compose the code authority of the foundry equipment manufacturing industry.

The board accepted the resignation of John D. Wise, who has become affiliated with the Pangborn Corp., Hagerstown, Md. Arthur J. Tuscany, Cleveland, was elected executive secretary of the association and of the code authority for the foundry equipment industry.

Joins Alloy Producer

Norman F. Tisdale, formerly connected with the Republic Steel Corp., Buffalo, and more recently with the Titanium Alloy Mfg. Co., has become associated with the Molybdenum Corp. of America, Grant building, Pittsburgh.

Curtis Pneumatic Machinery Co., St. Louis, has located its Chicago headquarters at 616 South Michigan avenue. Theodore E. Rolf and Warren J. L. Parish are representatives in that territory.

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LOW MAINTENANCE .....

These Osborn Jolt Squeezers have helped scores of foundries to increase their output while reducing their operating costs. They are flexible .... accessible .... built to give years of uninterrupted service. Descriptive literature on request.

THE OSBORN MANUFACTURING COMPANY

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Agencies strategically located all over the world

Aluminum Protects Monument

(*Concluded from page* 25)

importance in considering the future of countless aluminum architectural installations now in use.

A group consisting of H. S. Rawdon, chief metallurgist, and W. H. Mutchler, metallurgist, both of the bureau of standards, William W. Greig, construction engineer of the National Park service, under whose direction the monument was reconditioned, E. H. Dix Jr., chief metallurgist, Aluminum Research Laboratories, William H. Hunton and Ned Morris, both of Aluminum Co. of America, ascended the scaffolding and inspected the 50-year-old tip.

The condition of the 100-ounce pyramid was excellent. A gold-plated copper band surrounds the pyramid and is fastened to it by set screws, one in each of the four faces. Lightning rod tubes of gold-plated copper extend from the corners of the band and are attached to the steelwork of the monument proper. Prongs of gold-plated copper are found standing up from the top of the band and also at right angles from each copper tube.

Tip of Casting Struck

The tip of the aluminum casting was blunt from having been struck by lightning and fused, while the four faces of it above the copper band had taken on an oxide coating, very thin but uniform. The original surface was readily restored by a light scraping. A very small amount of pitting could be observed below the copper band, no pitting whatever above it. The pitting was so slight that it could only be seen under a magnifying glass and was probably the result of electrolytic action between dissimilar metals. If this pitting action were progressive, it would take 12,500 years before the pits become ¼-inch deep, but pitting of the same type is more pronounced at the outset rather than after a protective coating of aluminum oxide has been built up.

The cap has an aluminum purity of almost 98 per cent, the other two per cent being made up of 1 per cent iron and 1 per cent silicon, manganese, copper, tin and sodium.

Engravings on the four sides of the cap give the following legends:

NORTH SIDE

Joint Commission at Setting of Capstone Chester A. Arthur, W. W. Corcoran (chairman), M. E. Bell, Edward Clark, John Newton, Act of August 2, 1876.

WEST SIDE

Cornerstone laid on Bed of Foundation July 4, 1848; First Stone at Height of 152 feet, Laid August 7, 1880. Capstone Set December 6, 1884.

SOUTH SIDE

Chief Engineer and Architect, Thomas Lincoln Casey, Colonel, Corps of Engineers; Assistants, George W. Davis, Captain, 14th U. S. Infantry; Bernard R. Green, Civil Engineer; Master Mechanic, Peter F. McLaughlin.

EAST SIDE

Laus Deo

Work on the monument to the nation's first president was begun in 1848, 49 years after Washington's death. Lack of funds halted erection after the shaft had reached a height of 152 feet, and for many years, this unsightly pile was an eyesore in the panorama of the capital. Lightning shattered the stones at the top and they fell to a tumbled heap at the base of the monument. The abandoned structure became the butt of jokes the country over, until an act of Congress in 1876 provided sufficient funds to complete the structure. Work commenced in 1880, and 4 years later, the cap stone was set in place.

Since that time, it has been an object of beauty which has attracted hundreds of thousands of sightseers. It is still today one of the outstanding landmarks in a city whose magnificence has made it one of the most beautiful in the world. Reconditioning of the monument became necessary, and the National Park Service was detailed to this task. Scaffolding, the highest ever built for such a job, was erected around the monument from the base to the tip. The work progressed rapidly. A number of stones were replaced, the monument strengthened in several places, and the whole was thoroughly cleaned. It is again the column of beauty which it was when first completed.

Quad City Founders Discuss Refractories

John H. Owen, Harbison-Walker Refractories Corp., Chicago, spoke at the regular meeting of the Quad-City Foundrymen's association held Jan. 21 at the Fort Armstrong hotel, Rock Island, Ill. Clyde Burgston, president of the association, presided. Mr. Owen spoke on "The Manufacture and Use of Refractories" and illustrated his talk with motion pictures. He covered the subject of fire-clays and fire-brick as used in gray iron, mallable and steel foundries, as well as many other industries. He gave a brief history of the use of clays as a refractory and described how clay is formed so that it becomes usable for firebrick and fire-clay. Manufacture of bricks used in the several types of furnaces was explained and mention also was made of the care that is taken to keep the bricks within close tolerance as measured by performance.

Motion pictures of foundry sand handling equipment was shown and a brief talk was presented by A. G. Rapp, Rapp and Hollins Inc., Chicago.

The next meeting of the association will be held Feb. 18, and will discuss "Foundry Job Standardization."

Large Castings Shown At Open House

Allis-Chalmers Mfg. Co. held an open house at its West Allis, Wis., plant on Jan. 19 for the purpose of permitting visitors to inspect the work being carried on in the various departments. Attendance totaled more than 30,000 during the day. While the plant was not in operation, work in process was described.

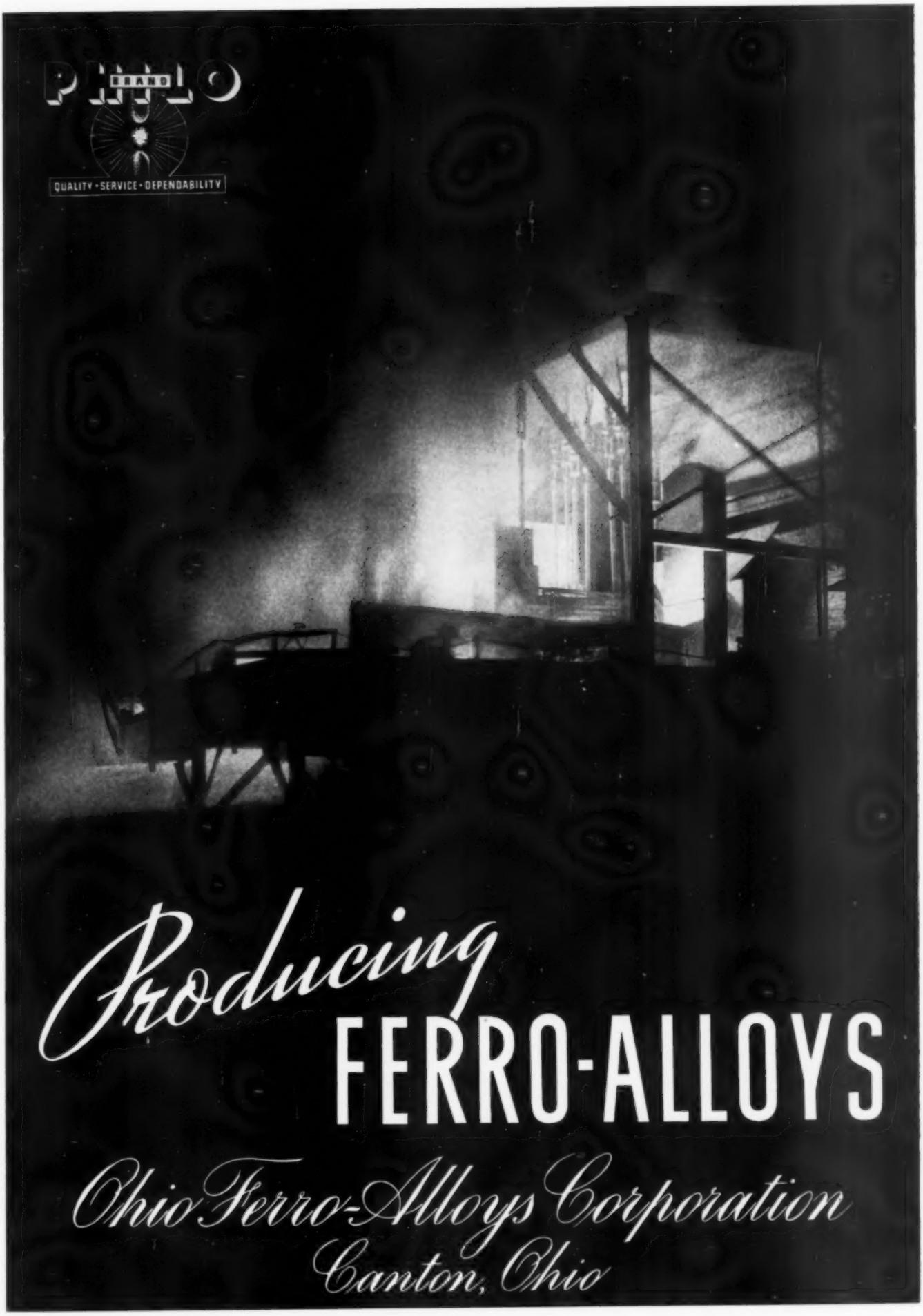
Of chief interest were the hydro-electric turbines now being built for the power plant of Boulder dam on the Colorado river. These units, four in number, are to be the most powerful turbines in the world, each capable of developing 150,000 horsepower. Castings for these turbines are 10 feet in diameter at the intake and are built in six sections to permit railroad transportation. Each casting weighs about 250 tons. Foundry flasks for casting the huge sections were on display as well as foundry equipment for pouring other large castings.

Other exhibits which attracted attention included roller gates being built for installation at the Mississippi river dam at Alma, Wis. Each section is 68 feet long and 15 feet in diameter. A steam turbine just completed for the Milwaukee Electric Railway & Light Co. also was exhibited. This unit has a capacity of 80,000 kilowatts. Products of other departments of the company also were shown.

About 100 press representatives were guests of the company at a luncheon held at the plant. Remarks of welcome were made by Otto H. Falk, chairman, and Max W. Babb, president.

Made Representative

Carl G. de Laval, recently was appointed sales representative of Electro Metallurgical Sales Corp., in the Pittsburgh district. Since 1925, Mr. de Laval has been connected with the production department of the Electro Metallurgical Co. at the Niagara Falls, N. Y. plant.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QUALITY · SERVICE · DEPENDABILITY
Producing
FERRO-ALLOYS
Ohio Ferro-Alloys Corporation
Canton, Ohio

Specializes in Jobbing Castings

(*Concluded from page* 28)

Several nails are used at points where the arms meet the hub and rim to insure that the sand will be held firmly in place. As may be observed from both illustrations, the mold cavity is gated at four points. Two of the gates open into the space between two arms, while the other two open into the alternate space between two arms. Part of the runner is in the drag the other in the cope. That located in the drag leads to the gates, and as may be observed, is split with strainer cores in each half where the metal enters. The portion of the runner in the cope extends from the central sprue to points directly over the strainer cores in the drag runner. The central sprue also contains a strainer core at the top, and a pouring basin leading to the sprue also is employed.

Liners Poured Horizontally

The diesel liners shown in Fig. 5 weigh about 324 pounds and are molded and poured horizontally. Flasks used for molding are 19 x 60 x 11 inches for the drag, and 19 x 60 x 8 inches for the cope. The molds are made by hand, and since the general form of the liner is symmetrical except for the vanes at the center, and the port openings near the ends, a plain half pattern containing core prints and mounted on a board is employed; the vanes and port openings being formed through dry sand cores.

The straight barrel core forming the center opening is 6 inches in diameter and 59 inches long, and is made in halves in a half core box and pasted together after drying. The core forming the vanes also is made in halves in a half core box split on the bosses. The halves are pasted together to form a cylindrical core which is slipped over the barrel core. The port cores are similarly made in halves in two different core boxes since they differ in number, size, and angular projection.

The port cores made in half-ring form are rammed up in the molds, half in the drag and half in the cope while as previously mentioned the assembled vane core is slipped over the barrel core. When the barrel core is placed in position the vane core fits into its print opening in the mold, leaving the required metal thickness all around. The mold is gated from long runners on each side, 8 gates being used. Substantial risers are located at each end while the sprues are at the center, leading from a pouring basin.

As previously mentioned, the Hamilton Foundry & Machine Co. makes numerous castings which, while not requiring the high physical properties of the specially processed gray iron, must be of the highest quality obtainable by regular gray iron production methods. Those include the group of scale or weighing machine castings shown in Fig. 2 which are produced on molding machines.

Fig. 8 shows the arrangement of a floor for producing fan-type scale housings such as shown at the left in Fig. 2. As may be observed, cores for the castings are made from green sand on a rollover core machine made by the International Molding Machine Co., Chicago. Copes and drags are made on jolt-strip type molding machines supplied by the Osborn Mfg. Co., Cleveland. Flasks used for the molds are pressed steel made by the Sterling Wheel Barrow Co., Milwaukee, and are 16½ x 23½ x 4½ inches.

The green sand core used in the mold is made in halves in loose corebboxes on the bench at the left in Fig. 8, the drag half is made first while still in the box, is placed on the platen of the rollover machine. Then the cope half is made and placed in position on the drag. The two coreboxes are clamped, rolled over and the drag corebox then is removed, leaving the completed core in the cope corebox. The drag mold is placed in position over the corebox, the whole clamped and rolled back, the corebox removed, and the drag mold containing the core lifted and put on the floor. Then the cope mold is made and put in place. Three men, two molders and one coremaker put up about 85 molds in 8 hours.

Another interesting molding operation is that used in making the cylindrical scale casing shown at the right in Fig. 2. That job also is made with a green sand core. The flasks used are 18 x 24 x 8 inches, and the method of making the molds and cores is similar to that previously described except that two men make the drag and cope cores respectively on one rollover machine, while two men make the cope and drag molds on two jolt strip molding machines.

The drag core is made in a loose corebox on the rollover machine while the cope corebox is fastened to the machine. The drag core contains 3 special core irons shaped somewhat like the letter S. The drag core is clamped on the machine platen to hold it in place, and then swung into the vertical position. At the same time the cope half is raised to that position, and the two halves are *booked* together. Then the two are swung back so that the drag core is up resting on the cope, and the drag corebox removed.

The drag mold is lowered over the core, clamped in position, and the whole rolled over as previously described. The cope corebox is taken off, and the mold containing the core is lifted off and placed on the floor. Then the cope mold is assembled over the drag on the floor. As may be observed in Fig. 2, the cylindrical scale housing contains two wide slots which are diametrically opposite, and the casting is gated along both edges of the slots with 4 gates along the upper edge in the cope and 4 gates along the lower edge in the drag, or 16 gates in all. The gates are fed from runners along each side with sprues located in the center of each. Pouring is from two ladles, one to a sprue. The average production of housing molds for the four men is 64 in 8 hours.

Several special features are provided for making a base for a large platform-type scale which is 23 x 42 x 7 inches in height. The flasks used are 31 x 48 x 4 inches for the drags, and 31 x 48 x 11 inches for the copes. Drag molds are made by two men on a jolt-rollover molding machine made by the International Molding Machine Co., and cope molds by two men on a plain jolt machine made by the Osborn Mfg. Co. Projections on the inside four corners are formed in ram-up or set cores.

The casting is gated along each side with 6 gates to a side. Sprues are located at both ends of the two runners, and risers are placed at the centers of the runners. Average production of those bases is 55 in 8 hours.

Book Review

Unfair Trade Practices, by Lincoln Filene, 134 pages, published by Harper & Brothers, New York, and supplied by The Foundry, Cleveland for $1.50.

In recent years considerable progress has been made to eliminate unfair trade practices among various groups of manufacturers. Growth of the trade association movement has furthered this goal, since each organization has undertaken to bring about greatly improved conditions. While this book deals with unfair trade practices between producers and distributors the author believes that the principles and treatment also are applicable to such practices where they occur between industries.

Membership on the Industrial Advisory board of the National Recovery Administration has provided the background for a discussion of the effect of numerous governmental agencies upon the elimination of unfair trade practices. This discussion includes information on the problem as it confronts modern business, early work on unfair trade practices, the growth of trade associations, trade practice conferences, and the principles and machinery for furthering this work under the codes of fair competition.

ADVERTISING PAGES REMOVED

Mixtures for Small Propellers

(*Concluded from page* 29)

Melting procedure where the charge is made up of new metal and gates includes: 1—Melt the gates. 2—Iron may be added either with the gates or after the gates are melted. In either case the metal must be covered with charcoal. 3—Push the aluminum under the surface. 4—Place copper on top of the pot. Ingots should be preheated. 5—When charge is melted, stir, add flux and stir again. 6—After about 10 or 15 minutes, pour the metal into a larger pot and then pour into ingots. These ingots are to be melted again and the metal poured into propeller molds. Common salt should be stirred into the metal after it is skimmed and just before it is poured into the molds.

Wire Usually Satisfactory

Ingot, lake or bus bar copper should be used. Good heavy wire usually is satisfactory and we have found no trouble that definitely could be traced to the use of wire. However, since considerable care is required to deoxidize the ingot copper, it would seem best to use material that is as free as possible from oxygen. Most wire is more or less dark from oxide, at least on the outside.

Tin plate clippings give better results than heavier forms of iron. Tin prevents the iron from rusting in storage and there is not enough tin left to do any harm. The thin iron is dissolved quickly by the aluminum and copper at lower temperature than heavier iron.

The best grades obtainable of zinc and aluminum should be used. They should be low in, or free from lead and silicon. The presence of a little iron does no harm.

An alloy containing copper, aluminum, iron and zinc is first cast into ingots before going into propellers. After various trials the following method has given the best results: 1—Copper, preferably ingot lake copper is melted under charcoal in the bottom of the pot. 2—It is deoxidized with whatever zinc is to be added to the mixture, thoroughly stirred in. The metal is allowed to stand in the fire for 10 minutes or longer to allow the zinc to react with the oxides in the copper. 3—About half the aluminum is pushed under the charcoal and molten copper. 4—The required amount of iron is added. 5—Remainder of the aluminum and gates, if any, are added last. 6—The charge is covered with a shovelfull of charcoal. The zinc should be thoroughly stirred into the copper, but the aluminum and iron should be pushed under the surface carefully and not stirred until they have melted. If they are stirred before melting, pieces of aluminum and iron may be held in the charcoal and never get into the bath at all. Stirring should be done just before introducing the flux. 7—After the charge has melted, 0.5 per cent of the flux shown in the accompanying table should be added and thoroughly stirred into the metal. After 10 or 15 minutes pour the metal into a larger pot and then into ingots. These ingots are analyzed and with the gates are used as stock for casting propellers.

If necessary, small corrections in analysis are made when the metal is being melted the second time. A cupfull of common salt stirred into the metal after the pot has been skimmed seems to correct the drossy condition which has given foundrymen so much trouble with this metal.

Flux for aluminum bronze is prepared as follows: 1—Melt copper under charcoal. 2—Add manganese copper. 3—Add about 1 pound zinc chloride. 4—Add magnesium. 5—Add about one quarter of the aluminum. 6—Add the calcium copper. 7—Add remainder of the aluminum.

This fluxing material is poured into small chill molds so that the resulting ingots easily may be broken into small pieces. About half of one percent (0.5) is added to a charge of virgin metal 15 minutes before pouring. maller amounts can be added to remelt charges.

Pouring of the metal is as important as careful melting. Any agitation will cause scum or dross to form that no amount of buffing will erase from the casting. Therefore the metal should be poured slowly and steadily. If this is done, one may observe the scum as it rises in the hub or boss of the propeller. Careful pouring will hold this film of scum intact until it comes up in a riser the same diameter as the boss and flared out toward the top. If slow pouring prevents the metal from running sharp to the ends of the blades, a shim 1/64-inch thick placed on each corner between drag and cope will ensure a perfect wheel with no appreciable difference in blade thickness.

Covers Group Insurance

National Industrial Conference Board, Inc., 247 Park avenue, New York, has published a 46-page booklet entitled "Recent Developments in Industrial Group Insurance." This book describes the growth, in a little over two decades, of the greatest structure of private industrial insurance anywhere in the world. The study of group insurance is based upon the experience of companies underwriting a vast insurance fund, and the many interprises utilizing various types of group insurance. The publication may be secured from the board for 50 cents.

Foundry Research At Bureau Explained

H. B. Gardner, research associate, bureau of standards, Washington, addressed the members of the Philadelphia Foundrymen's association at a meeting held Wednesday, Jan. 9 at the Engineers club, Philadelphia. Mr. Gardner spoke on "Foundry Research at the National Bureau of Standards", and outlined the research which is under way, looking toward simplification of specifications for copper base casting alloys. He also discussed other metallurgical activities of the bureau. Mr. Gardner's talk was illustrated with lantern slides.

Discusses Use of Nickel in Cast Iron

J. S. Vanick, development research department, International Nickel Co. Inc. New York, spoke before the New Jersey chapter of the American Society for Metals, Jan. 14, on the "Hardening of Cast Iron". J. W. Sands, of the same department, addressed the members of the Worcester, chapter of the A. S. M., Jan. 10, on "Fatigue Resistance". On Jan. 17, G. F. Geiger, of the same department, spoke before the Springfield Engineers club on "Applications of Nickel Alloys".

English Firm To Produce Furnaces

Detroit Electric Furnace Co., Detroit, has completed arrangements with the Birmingham Electric Co., Birmingham, England, for the manufacture and sale in Great Britain, the British Empire, and certain European countries, of the rocking type electric furnace manufactured by the Detroit company.

History of Iron

An interesting article "The Early Casting of Iron", by Thomas T. Read, Columbia university, has been reprinted from the *Geographic Review*, October, 1934 and may be obtained from the author for 10 cents.

Use Plaster for Foundry Patterns

(*Concluded from page* 31)

This frame is filled with plaster and removed. The plaster then is whittled to shape as in the first instance. It is not necessary that the shell should touch the core all around. For that reason the interior of the shell is scraped to provide clearance on the sides and at corners. The only places where the shell really needs to touch the core is on the bottom. The pattern is shellaced and then it may be given to the molder either for the purpose of making a working pattern, or in direct production of the required number of shells.

A device in which plaster is employed for mounting several small patterns on a plate in such relation to a center line that cope and drag may be rammed on the same plate is shown in Fig. 26. It is an adaptation of the cast iron transfer plate process, but presents many points of superiority in adaptability, ease of application and accuracy. Two duplicate frames, one of which is shown at *B*, are filled with plaster and take the place of the usual transfer plate.

One Plate Speeds Work

It is apparent that if one half of a symmetrical split pattern is on a plate all the half molds made from that plate will be alike. Unless the half pattern is mounted definitely in relation to two lines crossing each other at right angles in the center of the plate, it will be impossible to ram the other halves of the molds on the same plate. Advantage of using one plate lies in the fact that the molder can make drags and copes alternately without losing time, changing patterns or plates. The method also is applicable in mounting patterns for cope and drag on adjoining machines if necessary.

The heavy cast iron plate *C* is provided with reinforcing ribs on the back. The face is machined to a true plane after which a number of holes are drilled in the lugs for bolting the plate to the molding machine. A longitudinal center line is scribed on the face and two pin holes drilled at each for locating the flasks. Either the flask itself or a jig is employed to locate these holes. One hole at each end is smaller than the other, and later, pins provided with shoulders are fastened in these holes by nuts on the lower side. The larger hole at each end is made a loose sliding fit for the flask pin. In the illustration the holes *D* guide the cope half of the flask and the pins *E* guide the drags.

This is not an arbitrary arrangement, but may be varied to suit the position of pins on any type of flask. With possible slight variation due to pattern design, the following description applies to fitting up any patterns in the manner shown in the illustration.

A wood master pattern is made, split in the usual manner. Only half patterns are to be cast in metal, but even in cases where both halves of the pattern are alike and interchangeable, it usually is just as easy to make a whole wood pattern split in halves, as it is to make a half pattern. In the event that a considerable number of patterns are wanted, two half wood patterns will expedite the production. The metal half patterns are molded carefully and poured from one ladle to insure uniform contraction.

Half patterns are surfaced on the joint side, matched in pairs and marked with a small prick punch or in any other suitable manner so that they may retain their identity through all the succeeding operations. Theoretically all the halves are alike, but usually minor points of difference develop and for that reason it is advisable to keep each originally marked pair together. The half patterns are sweated together and finished to the required shape. If convenient, all circular surfaces are finished in the lathe. Two, three or more small holes are drilled completely through both halves of the pattern to serve as dowel holes. The usual precautions are observed to drill these holes as nearly vertical as possible, that is perpendicular to the parting plane.

The half patterns are separated and one set of halves placed in any desired position on one side of the longitudinal center line on the plate. The corresponding halves of the patterns are placed temporarily out of the way. The distinctive feature of the method now is brought into play. The cast iron frame *B* accurately planed on both sides is guided into place by the pins *F* which fit in corresponding holes drilled accurately on the center line.

Two Frames Used

This frame corresponds in a general but not necessarily accurate manner to the length and half the width of the flask employed in the foundry. Small wood plugs, long enough to extend above the top of the frame are inserted in the dowel holes in the pattern and then the frame is filled with plaster. As in all other instances cited, the plate and patterns are painted with vaseline, oil, grease, tallow or other protective coating before the plaster is poured over them.

After the plaster has set the dowel hole plugs are removed. The patterns are anchored firmly on the plate and while in that position a drill is employed to continue the dowel holes in the patterns into the plate. In this manner the future position of the patterns on the plate is assured. At this point they have not served their full purpose. The guide pins *F* are removed and the frame containing the patterns bedded in the plaster, is lifted, turned over and laid upon its back on the work bench.

The complementary half of each pattern, recognizable through the identification marks, is located by inserting pieces of rod the proper diameter to form a tight fit, through the upper and into the lower dowel holes in each pattern. Joint and patterns are painted with vaseline and then a second frame similar to that shown at *B* is set on in the same manner as any cope. It is filled with plaster and after the plaster has set the frame containing the plaster and the upper halves of the patterns is lifted off and placed face down on the other, in this case, the upper part of the plate.

The pins used on the first frame now are used to locate the second frame on the opposite side of the center line. The dowel pin plugs are removed and as in the first instance a drill is employed to continue the dowel holes into the cast iron plate. The frame then is lifted off for the last time, turned over and laid upon its back. The patterns are removed from the plaster, relocated on the plate by the dowel holes. Tight fitting pins are driven into the holes to attach the patterns to the plate. After the gate and sprue have been attached and a few minor adjustments made, the job is ready for the foundry.

Frames Are Used Again

After the frames have served their purpose the plaster is knocked out and they are ready to be used again. Among the many advantages of this method over the usual transfer methods, perhaps the feature connected with drilling the holes will appeal more than any other. A fair degree of accuracy is required in drilling the holes, but a slight deviation will not affect the relative positions of opposing half patterns.

Instances arise where it may be necessary to arrange four patterns or four groups of patterns on one plate. Two lines are drawn at right angles across the center of the plate. One hole is drilled at the point of intersection and a similar hole drilled on each line at a point corresponding in a general way with the boundary line of the flask to be employed. Instead of using frames half the width of the plate as in the foregoing example, a pair of frames large enough to cover only one fourth of the plate are provided. Details of fitting the patterns, filling the frames with plaster, etc., are the same as described.

This is the fourth in a series of five articles dealing with the use of plaster as a foundry pattern material. The fifth and concluding article will appear in an early issue. THE EDITORS.

American Ceramic society will hold a meeting in Buffalo, at the Hotel Statler, from Feb. 17 to 22.

The ROYER
SAND SEPARATOR AND BLENDER

has won the approval of leading foundrymen.

1800 Installations have proved The Royer to be correct in principle — sound mechanically, and low in operative and maintenance cost. The Royer has no equal in the preparation of foundry sand; both, as to quality of sand delivered, and low cost per ton of preparation.

"Formerly it took eight men twenty-five minutes to do the job. The Royer does it in ten minutes."

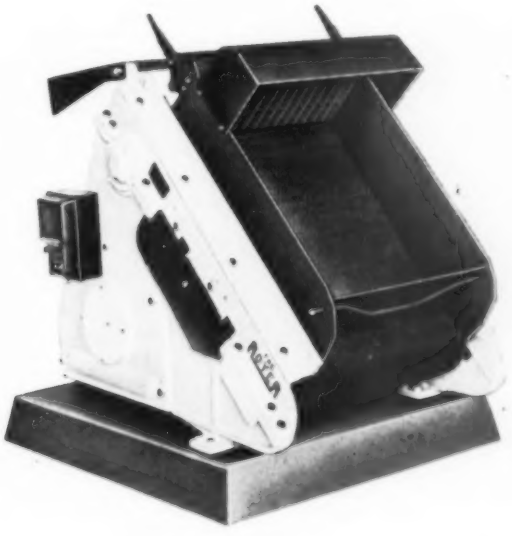
"Any foundry would find it one of the biggest assets should they put one into operation."

"It saves the wages of two men—and the upkeep is small in comparison to the work done." to the

"Clean and uniform heaps at all times, with unskilled labor —a very important feature."

"We use our Royer to cut over the sand on several of our large floors—it blends and aerates thoroughly."

"We save about $6.00 a day in labor through its use."



It will pay you also to install a ROYER

ROYER FOUNDRY & MACHINE CO.

158 Pringle Street ROYER PRODUCTS RECOMMEND THEMSELVES **Kingston, Pa.**

Iron Superheated in Open Hearth

(*Concluded from page* 32)

methods for producing iron with high strength and good machinability, is the superheating process developed by E. Piwowarsky and described in the April 1 and April 15, 1927, issues of THE FOUNDRY. The iron is melted in a cupola and then superheated and refined by a duplexing process in a specially designed type of open-hearth furnace.

The most recent development in this line is the Schury furnace, shown in Figs. 1 and 2. Up to the time of writing, approximately 20 of these furnaces have been installed in various European foundries engaged in the production of high grade gray iron, malleable iron and steel castings.

Describes Furnace Design

The furnace shell, either circular or rectangular, is built of steel plates and lined with refractory material that will withstand variations in temperature from irregular working. The furnace may be of either the stationary or tilting type and is mounted above two air superheaters. These superheaters are designed to provide red hot secondary air for perfect combustion. One or more burners of efficient design and construction are located in each side of the furnace. After it has been atomized, the hot secondary air is intimately mixed with the fuel and burns in the furnace at a temperature of approximately 3600 degrees Fahr.

This high temperature coupled with a neutral atmosphere produces iron of high quality and with little oxidation loss. The furnace roof is removable and the lining of the furnace is air cooled. After the flame has passed over the charge, the residual heat is absorbed in the superheater chamber and the final products of combustion pass through a chimney.

Assuming that the furnace is starting cold, the burners are swung into position and a torch is employed to light the atomized mixture of fuel and air. Subsequently the furnace is employed as the second unit in a duplexing process. Molten iron is tapped from a cupola and discharged into the hearth of the open-hearth furnace. After it has been refined and superheated the metal is tapped and poured into the molds in the usual manner. The slag is drained off, the tap hole is made up with ground ganister and, if necessary, the hearth is repaired for the following charge.

Where the furnace is employed as a single unit, it is attended by a melter with occasional assistance from a helper. Where the furnace forms the second unit in the duplexing process the help of an assistant is not necessary.

A charge of molten iron of normal composition is refined in 1 hour with an oil consumption of approximately 4 per cent of the charge. The resulting metal, homogeneous in texture shows a tensile strength between 43,000 and 45,000 pounds per square inch and a brinell hardness between 180 and 220. Results of a series of tests on iron from this type furnace are shown in Tables I and II. Micrographs shown in Figs. 3 and 4 were made from standard test bars in the same iron and show the pearlitic structure and the uniform distribution of the small graphite flakes. The cupola charge in each instance was made up of pig iron 40 per cent, return scrap 25 per cent, steel scrap 10 per cent and ordinary gray iron scrap 25 per cent. Total iron oxide, alumina and silica in the limestone must not exceed 3 per cent.

Soda ash is added to the charge to reduce the sulphur content when melting large amounts of scrap. The resulting slag is removed carefully to prevent return of sulphur to the bath. Gratifying results have been secured in this method of control.

Acid and basic linings have been used in the construction of these furnaces and the average life has been 350 heats starting each day with a cold furnace. In several installations the furnace is used for melting high silicon iron—up to 16 per cent—for pots weighing 10 to 12 tons, and other castings used in the chemical industry. The furnace also is used in steel foundries engaged in the production of castings which normally show a tendency toward pulling apart. The metal readily is poured from hand shanks.

From a cold start, the time from charging to tapping is approximately 5 hours for gray iron. Following heats of either gray or malleable remain in the furnace for 3 hours. The fuel consumption for the first steel heat amounts to between 15 and 18 per cent. For gray and malleable iron under the same conditions the consumption is approximately 10 per cent. The furnace is extremely flexible, lending itself readily to either continuous or intermittent operation.

Gray Iron Shop Trains Its Workers

(*Concluded from page* 19)

mimeograph sheets of each lesson. The employes contribute a few spare hours of their time each month.

The program for each evening includes a talk or lecture for approximately an hour followed by question and general discussion. Practical and technical features are presented by J. G. Goldie, foundry instructor, Cleveland Trade school. Sales, safety, shop management, job planning and production, and foundry accounts and budgets have been covered by officials of the company. General supervision of the course is under the direction of Charles F. Seelbach, vice president of the company and foundry manager.

Opens Regional Office

Worthington Pump & Machinery Corp., Harrison, N. J., recently established Pacific coast regional headquarters at Los Angeles. C. E. Wilson, vice president, is in charge of the division with headquarters at 510 West Sixth street, Los Angeles.

Table I

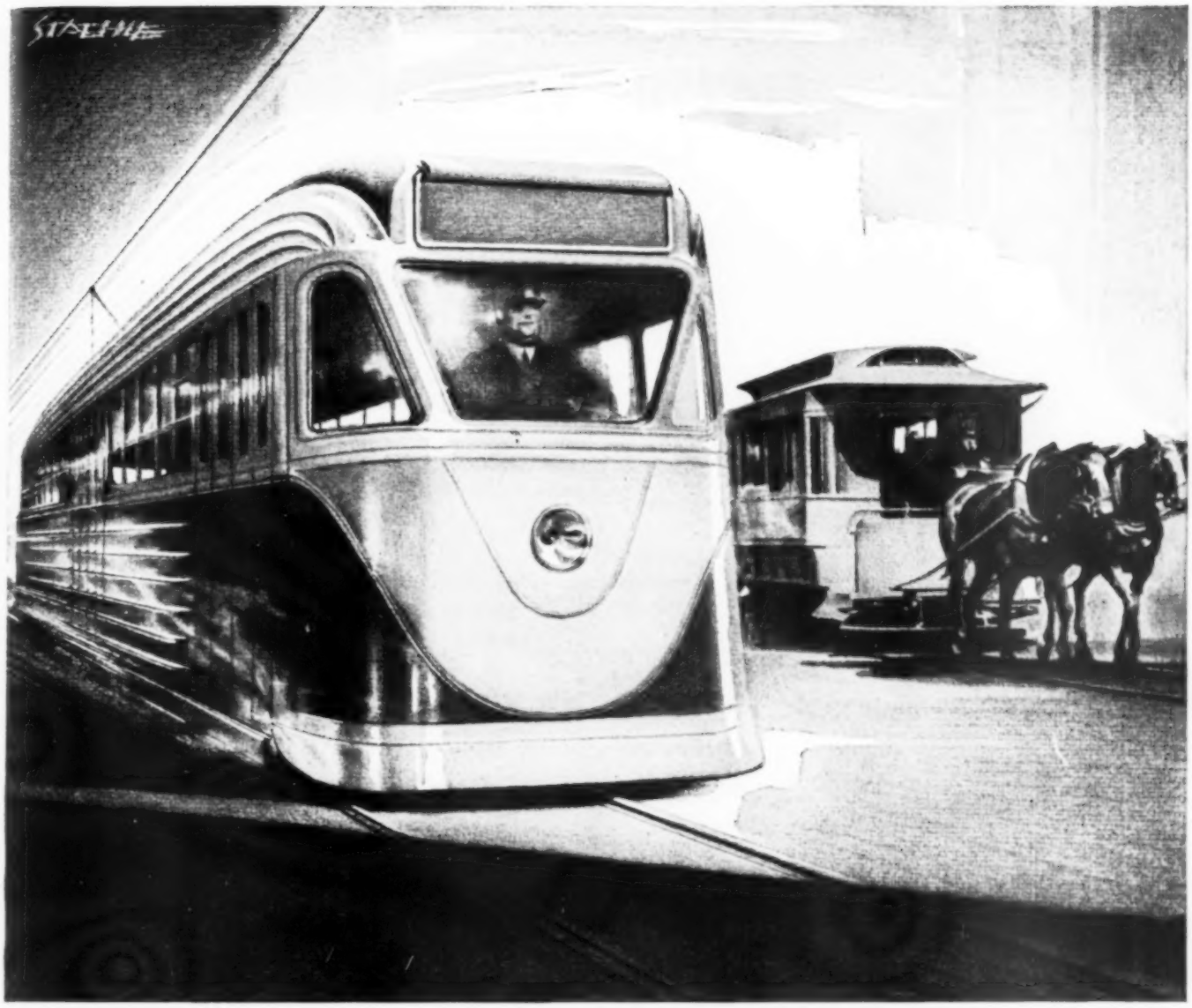
Cupola Iron Before Refining

Carbon	Silicon	Manganese	Phosphorus	Sulphur	Tensile strength	Brinell
3.20	1.45	0.70	0.55	0.08	39,200	195
3.17	1.49	0.75	0.49	0.09	40,030	200
3.24	1.42	0.76	0.48	0.09	38,070	196
3.14	1.39	0.78	0.59	0.10	41,020	204
3.22	1.39	0.69	0.46	0.09	41,080	210
3.19	1.43	0.73	0.44	0.08	39,400	201

Tabile II

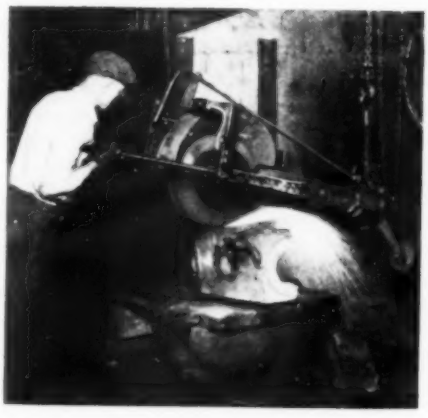
Cupola Iron After Refining

Carbon	Silicon	Manganese	Phosphorus	Sulphur	Tensile strength	Brinell
3.18	1.40	0.67	0.54	0.05	43,700	198
3.14	1.43	0.74	0.47	0.06	44,100	200
3.20	1.37	0.73	0.49	0.06	43,900	195
310	1.35	0.74	0.50	0.06	45,100	208
3.17	1.37	0.65	0.46	0.06	44,800	212
3.15	1.39	0.70	0.44	0.05	43,800	204



In Street Cars as in Grinding

yesterday's speeds won't do



Illustrated above is a typical snagging operation with a Bakelite Resinoid Bonded High Speed Wheel.

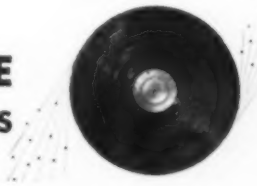
Rapid expansion of urban areas during the past generation made street cars drawn by ambling horses obsolete and unprofitable. Similarly, the low speed grinding wheels and machines cannot meet today's demand for high speed, economical production. ¶ High speed abrasive wheels mean wheels bonded with Bakelite Resinoid. Depending upon the type of grinding, these wheels may be safely operated at S.F.P.M. speeds 50% to 100% higher than those formerly considered practical. Bakelite Bonded snagging wheels, for example, operate at 9,000 S.F.P.M. instead of 6,000 S.F.P.M. Bakelite Bonded wheels run cool and do not gum even at highest speeds. ¶ Bakelite Bonded abrasive wheels for most types of grinding are made by all leading abrasive wheel manufacturers* who will be glad to advise you about them, and high speed machines for their operation. Write for booklet 15G

BAKELITE CORPORATION, 247 Park Ave., New York...43 East Ohio St., Chicago

BAKELITE CORPORATION OF CANADA, LIMITED, 163 Dufferin Street, Toronto, Ontario, Canada

* *The Trademark "REDMANOL" is also used to indicate abrasive products bonded with our resinoids.*

BAKELITE BONDED WHEELS



FOR HIGH SPEED GRINDING

The clipper does his daily dozen

The Adventures of Bill

BY PAT DWYER

THE other night, for no reason at all so far as I can remember, the assembled family staged an animated debate on the number of reindeer in the famous team which Santa Claus whips around the circuit on Christmas eve. Some of the members held out for four. Others distinctly remembered seeing six on a calendar. The youngest member stoutly maintained the correct number was eight, just one short of the number required in a baseball team. She is a walking encyclopedia on every phase of the great national game and naturally she views everything through what you might call a baseball eye.

Unfortunately while every person in the group was willing if necessary to die in defense of the faith that was in him or her, not a single one could quote the names of the prancing steeds. Dasher and Dancer were fairly well known, also Donder and Blitzen. This unanimity of opinion convinced the four-team member that he was right. The other members, the hold-outs for the sixes and eights, laughed this silly claim to scorn. You could not make rhyme out of those four names. Great business of intense concentration and vain effort to remember what came after "'Twas the night before Christmas, and all through the house not a creature was stirring, not even a mouse."

Finally, one charming young matron who is now about the age I was at the period to which she referred, cut the Gordian knot by appealing to me. She claimed, which of course is a gross exaggeration, that I had held her on my knee and read the poem to her hundreds of times. Therefore I should remember the list of names. I pointed out with the proper degree of parental severity that apparently she had failed to profit by this extraordinary care and solicitude on my part. Here I had toiled and moiled like a slave morning, noon and night trying to instill an appreciation of great poetry in her mind, and what was the result? I mournfully wagged an imaginary bush, rolled up my eyes and spread the hands wide apart to indicate that all was lost and that we might as well jump for the lifeboats.

Was she impressed by this display of grief on my part and the public revelation of her failure to live up to my fond expectations? Oh, yes. She was properly impressed.

"Quit stalling, Paw," said she. "Atta boy! You never failed me yet!"

There I was on the spot. To quote an analogous and familiar legendary example I was another Casey At the Bat. As was the lamentable case in Mr. Casey's famous case, I struck out.

Straightening out the team in my mind I had no difficulty in locating the leaders, Dasher and Dancer, followed by Comet and Prancer. The wheelers —I suppose they are called wheelers even when attached to a sleigh—the wheelers, Donder and Blitzen occupied their proper place next to the sleigh. If my immortal salvation depended on the result I could find no mate for Vixen. I had a dim impression that Cupid was the name, but I could not imagine jolly old St. Nick linking cute little Cupid with that slinky, slant eyed little crab included in the team.

Later knowledge came last night—too late as usual—while I was rooting around in a drawer where I keep papers of various kinds including newspaper clippings and other odds and ends. Pawing through the mess I came across a copy of the *Night Before Christmas* and—although I normally was certain to forget it before I needed it again—I checked up on the names of the reindeer. I was gratified to a certain extent to find that my batting average was between fair and middling. According to a famous old Christmas composition Comet and Cupid constituted the third pair, while the sprightly Prancer was on the opposite side of the pole from Vixen.

Bill came in while I was engaged in this tunneling and excavating job. After watching for a while and having heard a detailed account of the reindeer episode and its happy outcome, he kindly suggested that I either should ditch what he termed the whole mess of junk, or, file it in a manner that would enable me to put my hands on anything I wanted when I wanted it. In the present instance he declared that the place looked as if a highly ex-

(*Concluded on page* 69)

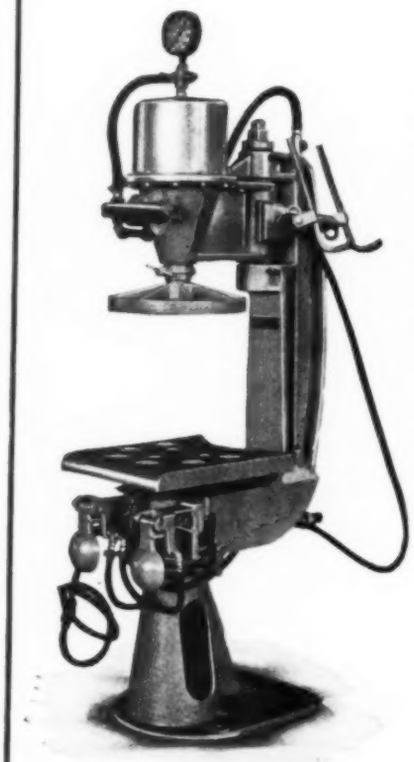
Six minds with but a single thought and they are all wrong

TABOR
TRADE 1884 MARK

LATEST DESIGN TABOR TOP SQUEEZER

These low priced Squeezers strengthen Tabor's position at the head of the field. Watch subsequent advertisements for further interesting announcements of Tabor developments—

THE upright member is chrome molybdenum, exceptionally sturdy channel construction. Squeeze head centrally located over table. Ball bearing swing head. The jar mechanism mounted directly over the base provides rigidity which gains advantage of the full jarring blow. Unusually large wheels make the portable machine really portable. Each machine is furnished complete with vibrator, pressure gauge, blow valve, and pattern plate rack. In addition, the portable machine has a riddle rack and mold shelf. Vibrating and jarring valves are operated by knee control.



FOUNDRY MOLDING MACHINES AND FOUNDRY EQUIPMENT

The TABOR MANUFACTURING COMPANY
6225 TACONY STREET, PHILADELPHIA, PA.

Western Representatives:

Northern California
PACIFIC GRAPHITE WORKS, Oakland, Cal.

Southern California
SNYDER FOUNDRY SUPPLY CO., Los Angeles, Cal.

Utah District: UTAH FOUNDRY SUPPLY CO., Salt Lake City

Foreign Representatives:

Great Britain: MACNAB & CO., 150 Holborn, London, E. C. I, England
Australasia: Norman N. Benson, 532 Kent St., Sydney, Aus.
Continental Europe: Giesserei-und Werkzeugmaschinen, G. M. B. H., Frankfurt a. M, Hochst, Schliessfach, Ger.

NRA MEMBER

Established 1884

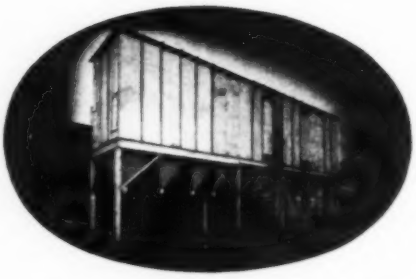
You can't SEE the REAL DUST PROBLEM

PARTICLES so small as to be invisible, measuring perhaps 10 microns (a micron is .00003937 inches) constitute a real dust problem. These cause numerous respiratory diseases, a matter which should cause any operator of any plant where dust exists in any form—to do some serious thinking.

Ordinary dust removal systems may be satisfactory in carrying off the larger visible particles from your operations, but this is not dust collection in an engineering sense nor will it reduce your liability.

The cloth filter type of dust collection system, the best example of which is the BLAW-KNOX FRAMED BAG DUST COLLECTOR, is the only final way to "lick" the dust problem—insure against industrial disease—satisfy legal requirements (many states have them) and keep down maintenance expense.

If you have any dust in any operation in your plant, write Blaw-Knox today.



Blaw-Knox Framed Bag Dust Collectors. Muskegon Piston Ring Co., Muskegon, Mich.

Blaw-Knox Framed Bag Dust Collectors set in tandem. Perfect Circle Co., Hagerstown, Ind.

BLAW-KNOX COMPANY

2097 FARMERS BANK BUILDING PITTSBURGH, PA.

Offices and Representatives in Principal Cities

BLAW-KNOX

STEEL FRAMED BAG DUST COLLECTORS

(*Concluded from page* 66)

eted badger had passed through a junk yard in a hurry.

"Here," he said, picking up a letter dated several months before and addressed to Arthur Brisbane, "What's this? I did not know that Art was an old pal of your's."

"No pal o'mine, ol' pal. I never even have seen the man."

"You're a better man than I am Plug O'Wind. I am all of a tremble and sweating at every pore by the time I finish a brief letter to a friend or acquaintance, and here you have written a letter as long as from here to there, to a bird you don't know. Seems to me a word or two of explanation would not be altogether amiss in this crucial moment."

"Read it, my boy," I said. "Read it and you will find that the letter is self explanatory. Written while I was feeling in proper crusading spirit after reading the following full page advertisement in a well known publication:

I have recently undertaken the direction of the *New York Daily Mirror*, a tabloid newspaper that now has more than 500,000 circulation daily or more than 1,000,000 Sunday.

Deeply interested in this work, I wish business and other friends, and those with which *The Mirror* comes in commercial contact to know of my association with the *New York Mirror*.

The *Mirror* is a newspaper planned to represent the period in which we live, emphasizing brevity in expression, and the use of illustrations that tell their story more quickly than words.

I hope to make the *Mirror* increasingly useful to its readers and serviceable to business men, through their advertising.

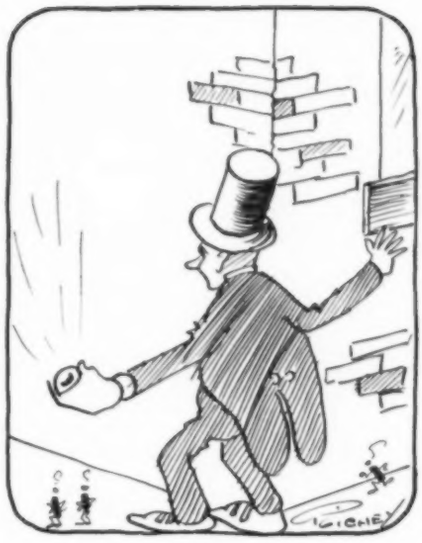
I believe that the *Mirror* can be made one of the most useful newspapers in America, advising and informing the young for their good, while earning the respect and encouragement of older men and women. I shall be grateful for suggestions for improving the *Mirror* and particularly grateful for frank criticism. Sincerely,

ARTHUR BRISBANE

"Well," said Bill. "I'll tell you. I believe a couple of passes through the rolls would not do it any harm. Kind of suqeeze some of the gas out of it. Apparently Art does not place much confidence in the reader's intelligence or memory when he has to mention the name of the paper in every little short paragraph. To be consistent in his claim for the value of brevity in expression and the superiority of illustration over the printed word he should have used a single illustration instead of a long collection of words."

"A single illustration?"

"Sure! why not? A single picture showing the genial Mr. Brisbane snatching the torch—pardon me—the mirror from his predecessor, the while he exclaims in a loud voice 'Excelsior,' meaning now watch the dirt begin to fly in Father Knickerbocker's back yards, alleys and the riverfronts.



Ye Editor spots a hot one

"However, that is merely what you might call a snap verdict, subject to change without notice upon the submission of further evidence. Let's see what you wrote."

Mr. Arthur Brisbane,
The New York Daily Mirror,
New York, N. Y.

Dear Arthur:

This is merely the conventional form of greeting and really means nothing since you do not know me and I know you only as an author of paragraphs, in many cases unrelated, which appear as a column in certain papers which I see occasionally. Some of these paragraphs coincide with my own views, and others do not. I simply mention the fact to indicate that I am a neutral so far as you are concerned, neither an admirer nor a critic. I recognize the fact that you have a perfect right to express any opinions you please. I only envy your facility in getting away with it and your ability to persuade people to pay you handsomely for the effort.

This is all in a spirit of good, clean fun, Art, so please do not grind your teeth and throw the remainder away un-read. Remember you little rascal, you asked for it on page 15, Dec. 1, 1934 issue of *Editor and Publisher*, a full page display announcing your affiliation with *The New York Daily Mirror*.

Possibly in the multiplicity of duties and the frantic scurrying to and fro of the secretarial squad, the item has slipped your memory. Permit me to quote the concluding sentence of the advertisement: "I shall be grateful for suggestions for improving *The Mirror* and particularly grateful for frank criticism."

Between ourselves, Art, I know what you mean. You are inviting frank criticism of *The Mirror*, policies, appearance, content, makeup, etc. Living as I do out here in the sticks, your method of conducting the paper is not of the slightest interest. My criticism is ethical rather than practical and is based on your amazing lack of consistency. In your advertisement you say: "*The Mirror* is a newspaper planned to represent the period in which we live, emphasizing brevity in expression, and the use of illustrations that tell their story more quickly than words."

In the face of that statement you are as garrulous as a magpie, and as tiresomely repetitious as a tame parrot in wording your message.

How come? sez you, or the New York equivalent for this here now homely interrogation. Well, as your sterling fellow New Yorker is wont to remark under similar circumstances "Let's take a look at the record."

The advertisement or announcement as it stands and if my counting finger is in good working order runs to 166 words. The most astute penny a liner working at high pressure could not have inflated the material to any greater extent unless he employed rubber words. For a brevity advocate the exhibition simply is deplorable. Without any effort at all the message could be compressed into about 70 words without sacrificing any essential feature:

I have undertaken direction of the tabloid *New York Daily Mirror*, daily circulation over 500,000, more than 1,000,000 Sunday. *The Mirror* reflecting the present period, emphasizes brevity in words. Illustrations tell the story more quickly.

I believe *The Mirror* can be made one of the most useful papers in America, advising and informing the young, earning the respect and encouragement of older men and women. I shall accept gratefully suggestions and frank criticism.

Emulating your example Art of dwelling upon and reiterating the obvious, let me point out that most of the wind and water have been squeezed out of the first and third paragraphs of the original. The second and fourth paragraphs have been thrown into the discard. The second paragraph because it merely is a restatement of the fact mentioned in the first paragraph that you have joined *The Mirror*, and the fourth because you separate the readers and business men into sheep and goats and they might not like that. Some business men can read.

"Well," said Bill, "I'll tell you. You have gone to a great deal of trouble for nothing. In the first place Art has a perfect right to spread himself over the page to any extent he pleases, since presumably he is paying for the privilege. In the second place your letter never would penetrate beyond the seventeenth assistant secretary. Therefore the great man never would see it. In the third place your kindly comment is a little late since the advertisement appeared—when did you say, in December ?—and in the fourth and last place, outside Art and the owners, who cares whether the paper is published or not?"

Points To Causes of Porosity

(*Continued from page* 33)

9.—Often a skimming rod which has been used for some time is dipped into a shank pot of steel, and when made red hot at the end is pointed at the gate-cup to help the steel pourers clearly to see the opening for the metal stream. Occasionally, these skimming tools have considerable oxidation scale and foundry floor refuse adhering to them. Such a condition may result in the formation of pin holes caused by gas taken up by the metal. Considering the various kinds of gas-forming materials that temporarily or permanently may be attached to a skimming rod and be volatile at the temperature of liquid steel, the safest plan is to use only such skimming tools as are relatively clean.

10.—Some persons think inadequate feeding is a contributing cause for porsity, but probably the relationship is nonexistent, and is assumed after inaccurate diagnosis. Where the design of the casting and nature and position of risers are such as to prevent complete feeding at fillets and corners, occasionally there is found what seems to be a concentration of pin holes. In this way pin holes may *appear* to be caused by inadequate provision for shrinkage.

11.—Thorough sand mixing is necessary to prevent too much moisture in part of the batch, and not enough in another part. Skillful introduction of binders helps to distribute the moisture. When considerable dry binder is dropped into a mixer-batch at one time and immediately comes into contact with much moisture, the binder may become soaked and retain the water; possibly later forming a strongly bonded, lumpy mass of material that cannot be distributed properly through the sand, and may be much wetter than it should be.

Extent to which moisture is needed in the mixture as delivered from the sand mill, largely is regulated by precautions taken against the evaporation of moisture in the transfer of the sand to the molders, and in storage of the sand at molding floors and benches. Weather conditions affect rapidity of moisture evaporation.

Bentonite or a bentonite product calls for a smaller amount of water in the sand mixture than when fire clay is employed as the sole or chief dry binder. When water in the mixture does not get opportunity to evaporate to any extent, it may be best, from the standpoint alone of porosity prevention, to use a bentonite material instead of fire clay as the principal binder. Other conditions should be kept in mind. If so much water evaporates as to leave the sand crumbly, of course trouble results in dirt spots and other defects. Probably the use of any cereal binder helps to prevent evaporation.

12.—Precautions should be taken when using farinaceous binders. They burn quickly when exposed to liquid steel. One result of such combustion is the formation of gas. If ample opportunity is not afforded for such gas to escape, pin holes are likely to result.

13.—One cannot state in accurate, general terms how low a permeability value in facing or backing sand causes likelihood of porosity. Not only does the sand mixture itself influence susceptibility, but thickness of sand above the mold cavity has considerable to do with the matter. A shallow cope naturally permits gases to escape between the particles of sand more quickly than a deep cope. The safest plan is to learn from experience with a given sand, the permeability necessary for the deepest molds; also for molds which, because of the design of the casting and the nature of the risers and vents, present maximum susceptibility to porosity.

14.—No one can lay down satisfactory rules for the venting of molds except in general terms. Location of risers affect this factor. Vertical vents are better than side vents in letting gas escape quickly. It is not possible to provide too free an outlet for mold gases if we want to take every feasible means to prevent pin holes. It is much safer to use many vents than to take a chance on a small number.

15.—Low green strength of facing causes cutting or erosion, which in turn gives greater surface contact of the liquid steel with the individual particles of the sand mixture. Some of these particles may be converted readily into gas when the metal completely surrounds them, as it will ordinarily when bonded grains are broken away from the face of the mold proper. While a weak facing sand causes cutting, it may at the same time create pin holes where the casting surface is the roughest. This striking combination of cutting and porosity has been seen on many castings during pin hole epidemics.

16.—Green facing seemingly should be capable of partially baking : the result of contact with ' steel, so as to acquire or -trength while becoming [illegible] heated in the pouring operation. If it has necessary strength, it will retain its rammed form, and cutting will not result. If it crumbles while being heated, some of the trouble mentioned in item 15 may be experienced.

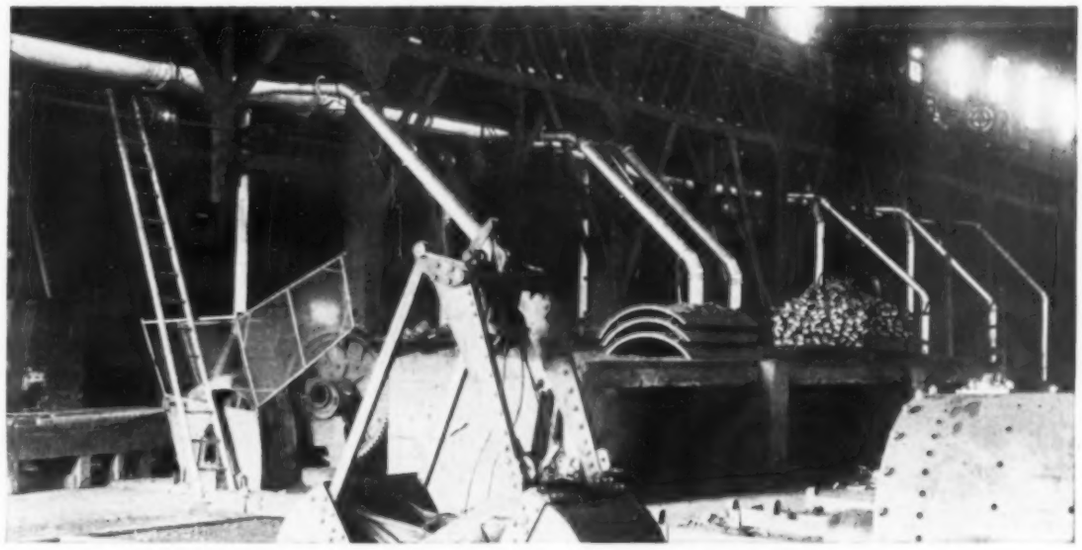
17.—Oxidized metal parts of molds may be chaplets, chill plates, chill coils, rods, nails, wires, and other ferrous metal parts which have become rusty. Oxide caused by rusting, when in contact with liquid steel, forms gas that often may result in pin holes. In some foundries, rusty metal parts are found more often in cores than in molds proper, due to the spraying of green cores in which horse shoe nails or other metal parts are secured.

18.—Total moisture content of an entire mold may be satisfactory, while at the same time there may be an excessive amount of moisture on parts of the surface of the mold proper or in that portion of the mold forming the gate or sprue. This often is brought about by condensation. The longer a green sand mold stands on the floor, the greater is the degree of condensation producible under ordinary shop conditions. This concentration of water on the inside surface of the mold should be guarded against by reasonable air drying; also by pouring molds as soon as possible after they are closed. When it is necessary to store closed molds for many hours on the pouring floor, frequently it is advisable to lift the copes and see that all portions are

(*Concluded on page* 72)

Twenty-five Causes

FOLLOWING a presentation of 25 potential causes of porosity in steel castings, the author itemizes in considerable detail certain practices and methods of procedure calculated to prevent development of that form of defect. However, a delicate balance needs to be maintained between the combination of conditions that will prevent porosity and the combination that will cause it. One of many details of foundry practice may get out of hand sufficiently to disturb the balance and throw the weight on the wrong side of the scale with resulting pin holes. This is the second and concluding section abstracted from a paper presented by R. A. Bull, steel foundry consultant, Chicago, before the Philadelphia convention of the American Foundrymen's association.



Removing dust from a row of tumbling mills, using extra heavy gauge piping

Safeguard Health with K & B Dust Collecting Systems!

The installation of Kirk & Blum blower equipment, backed by K & B Engineering Service, is the definite solution of your dust removal problem—cutting your power costs and insuring healthful plant conditions. Write for detailed information.

KIRK & BLUM
Dust Collecting Systems

THE KIRK & BLUM MFG. CO.,
2808 Spring Grove Ave., Cincinnati, Ohio
Detroit Factory and Office: 4718 Burlingame
Chicago Office: 3843 N. Central Park Ave.
Pittsburgh Representative:
Bushnell Machy. Co., 1501 Grant Bldg.
Louisville Representative:
Liberty Blow Pipe Co., Inc., 325 Roland St.

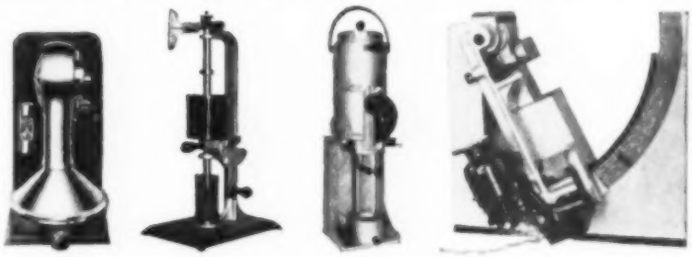
BE ON THE PREFERRED CASTING LIST . . .

Sand Control Separates You From The Careless Foundry List

Poor sand condition means a high scrap casting loss. This is your immediate loss. A high loss also means a proportionally larger number of partly scrap castings shipped to your customers. This puts you on the careless foundry list.

Are You Holding Back The Foundry Industry?

Write to



Moisture Teller — *Sand Rammer* — *Permeability Meter* — *Universal Sand Strength Machine Type C. P.*

Harry W. Dietert Co.-676 W. Grand Blvd.-Detroit, Mich.

ARCADE CHERRY SLIP FLASK

Highest Grade Lumber
Very Accurate Dimensions
Reasonable Prices
Jackets to Fit

ARCADE MANUFACTURING COMPANY
Freeport, Illinois

(*Concluded from page 70*)

satisfactorily dry before the metal is poured.

Moisture condensation partially can be guarded against by using bent rather than flat sheets of metal or other material, occasionally employed as covers to prevent refuse from dropping into sprues and risers. A cover of this kind shaped to provide a liberal air space helps to prevent an early accumulation of drops of water on the under side of the cover above the down-gate. The presence of water here indicates that at least a part of the channel for the down-gate may be saturated. Such a condition invariably produces steam, which cannot help but be absorbed by the steel as it rushes into the mold proper. Pin holes usually appear under such conditions.

19.—Suitable proportions of useful volatile matter, such as grain products of various kinds, may be distributed carelessly in the mixing operations, so that too much gas-forming material may be segregated. These lumps made up largely of bonding material may be rammed against a pattern in a location vitally dangerous from the standpoint of pin holes. Obviously the proper course is to see that every batch is milled properly according to a definite schedule, and that each batch is of the proper size to prevent overloading the mill. If the batch is too large for the mill capacity, the materials in it cannot be distributed properly in the time satisfactory for a batch of proper sizes.

20.—Contact of the liquid steel with cereal binders produces gas, because binders readily are combustible. If the green strength of the facing depends too greatly on such volatile materials and not sufficiently on clay bentonite, a large amount of gas in the mold naturally will result, causing liability to pin holes.

21.—Occasionally cores contain a large total amount of gas-forming materials due to the use of farinaceous liquid or pitch binders. Some cores are so shaped or placed in the mold that satisfactory outlet for the developed gases cannot be provided, if much gas-forming material is contained in the core mixture. This condition may result in an absorption of considerable gas by the steel and pin holes in the castings.

22.—When practice justifies the use of a baked core, it should be dried thoroughly and then stored in a way to prevent its absorbing an appreciable amount of moisture.

When desirable mold conditions call for a core that should be thoroughly dry, and the core has been stored carelessly in a place that caused it to take up moisture, the extra amount of gas subsequently generated may result in considerable porosity.

23—Probably the venting of cores cannot be overdone. In many cases, vents in cores are not as large as they easily might be made for maximum security against the entrapment of gas. Holes for such a purpose should be liberal in size, largely because small holes are so easily choked by accident as when a small pebble may become lodged in the end of the vent hole. Every core contains some material that will produce gas when in contact with liquid steel. Metal flowing over a defective core forms gas which may not have a chance for complete escape, but may cause gas laden steel finally to lodge in a part of the mold that is not close to the troublesome core. In this way, gas picked up by the metal from a core or part of a mold proper may result in pin holes in another part of the casting, deceiving the investigator as to the disturbing location.

24—Pin holes on one occasion were found to have been caused by particles of coal in the fire clay put into the facing sand. Fire clay deposits in the ground often immediately adjoin coal seams. When such clay is not skillfully mined and prepared for use, it may be mixed with coal fragments, which of course are volatile Care should be taken to see that no material such as clay intended to be pure, contains ingredients that might form gas that could serve no desired purpose but might be a cause of porosity.

25—Experienced steel foundrymen know that a casting may be of such design as to make it particularly susceptible to porosity. Often this seems to be due partly to a mold surface of large area compared with the weight of the casting. The greater number of square inches of green mold surfaces in contact with the liquid metal, obviously the more opportunity there is for the steel to absorb gas from the mold.

In many castings that seem inclined to have pin holes, skillful design of the gating arrangement is helpful. A gate that tends to force the gas ahead of the metal in a continuous flow is preferable from a porosity as well as from other standpoints. Certain castings which originally gave much trouble from porosity have been freed from this difficulty merely by changes in the design of the gates.

The classified list of porosity causes is not submitted in the belief that there has been mentioned every major or minor cause for pin holes that may be related to conditions incidental to molding, core-making, gating, venting, storing, pouring, etc. Furthermore, it is not maintained that every factor herein listed can be proved either a regular or occasional cause of porosity. Where any detail of shop practice may be suspected as an occasional producer of pin holes in the steel casting, the foundryman wisely may adopt precautions to keep this possible factor under proper control, if for no other reason than because it is under suspicion.

The preceding list of possible causes was prepared without effort to name these in the order of their relative importance or in the order of consecutive shop operations. Probably it will be clear to any student of porosity that the author has subjected himself to the risk of logical, negative argument, in so far as some possible causes have been indicated. On the other hand, there must be numerous causes for pin holes which have not even been suggested in the above listing. Long experience in fighting porosity makes the author believe that his attempted analysis probably has many deficiencies. Nevertheless, good may be accomplished if the naming of possible causes serves merely to emphasize for some foundrymen, whose duties have prevented them from intensively studying pin holes, the importance of exercising the utmost care in regulating many details of shop practice that may be related.

In the first part of this paper mention was made regarding a condition which now may be touched on briefly as a closing comment. Apparently there is a very delicate balance which needs to be maintained between the combination of conditions that will prevent porosity and the combination of conditions that will cause it. One detail of foundry practice, among a good many, may get out of hand sufficiently to disturb the balance and throw the weight on the wrong side of the scale, resulting in pin holes. It often may happen that, when porosity occurs in very troublesome degree in the steel foundry, there are several causes operating in unison.

The author's experience causes him to think that this condition usually prevails in times of porosity trouble, in plants making small steel castings in green sand, while pin holes in large castings poured in dried molds probably arise more often from a single factor. Whatever may be the kind of steel casting under consideration, it is clear that more trouble for the producer is likely to result when several potential causes for gas cavities exist, as compared with a single cause. It would appear that every cause for pin holes, whether occasionally it can be positively identified as a primary factor or not, frequently may be a contributory one. The procedure logically suggested by this line of thought is unremitting skillful attention to every detail of foundry practice that is known or is thought to be controllable.

"CERTIFIED"
Steel Abrasives

WILL REDUCE YOUR BLAST CLEANING COSTS.

WHY?

Because—20 bags of "Certified" Steel Grit, or Steel Shot, will do the work of a car load of Sand.
Because—"Certified" is so easy to use.
Because—"Certified" is so easy to store.
Because—"Certified" is so economical. It is easily cleaned, and can be used over and over again.
Because—"Certified" is safe, and decreases dust hazards.

Send for free samples.

PITTSBURGH CRUSHED STEEL CO.
PITTSBURGH, PENNA.
STEEL SHOT AND GRIT CO.
BOSTON, MASS.

CLEVELAND

Quality
Service
Durability

Write for
Discriptive Catatog

Vibrators

Cleveland Vibrator Company
2100 Superior Ave. W. Cleveland, O.

MOISTURE

Do you CHECK or CONTROL IT?

The "SPEEDY" moisture tester permits an accurate control of both molding and core sands while in the mixers, so that sands go to molding floors and core room with proper moisture content.

If you are interested in

SAND MOISTURE CONTROL

Fill in coupon and return to

The Alpha-Lux Co., Inc.

192 Front St. N. Y. City

THE ALPHA-LUX CO., INC.,
192 Front St., New York City

We are interested in demonstration
of Speedy Moisture Tester

Firm Name .....

Address .....

Signed .....

Obituary

JOHN B. RIPLEY, president, J. B. Ripley Brass Foundry, Inc., Windsor, Vt., died recently at his home. Mr. Ripley was born at St. Johnsbury, Vt., Dec. 30, 1861 and graduated as a journeyman molder in 1883 from the old Paddock Iron Works, St. Johnsbury, the foundry in which his father learned his trade and which formerly was conducted by his grandfather. He then worked in a number of shops including the Fairbanks Scale Works, St. Johnsbury; as well as plants in Nashua, N. H., Orange, Mass., and Lyndonville, Vt. In 1919 he started a small brass foundry for himself in Windsor

J. B. Ripley

and incorporated the company in 1923. Mr. Ripley was active in industrial and social affairs and was a past president of the Rotary club.

♦ ♦ ♦

William H. Dotter, 68, president of the Frog, Switch & Mfg. Co., Carlisle, Pa., died Jan. 19.

♦ ♦ ♦

George P. Stirm, 55, for 26 years foreman of the Lansing Co., Lansing, Mich., died Jan. 22.

♦ ♦ ♦

Joseph G. Sailer, 68, one of the founders of the Sailer-Whittmore Foundry Co., Menasha, Wis., died Jan. 10.

♦ ♦ ♦

William G. Spence, 82, for many years vice president of the Rundle-Spence Mfg. Co., Milwaukee, died in Milwaukee Jan. 19.

♦ ♦ ♦

John M. Dwyer, for many years president of the Peninsular Stove Co., Detroit, died Jan. 16. Mr. Dwyer was born in Detroit Sept. 19, 1864, son of the late Jeremiah Dwyer, who with his brother James, founded the J. Dwyer & Bros. Co. which later became the Detroit Stove Works. Jeremiah Dwyer later founded the Michigan Stove Co. and the Penninsular Stove Co. of which latter concern, his son, John M., became chief executive.

♦ ♦ ♦

Henry B. Wood, superintendent of the foundry department, Singer Mfg. Co., Elizabeth, N. J., died recently in Elizabeth.

♦ ♦ ♦

Alba B. Johnson, 76, chairman of the Southwark Foundry & Machine Co., Philadelphia, and former president of the Baldwin Locomotive Works, Eddystone, Pa., died recently at his home in Rosemont, a suburb of Philadelphia.

♦ ♦ ♦

E. E. Berliner, 59, for a number of years connected with Alloys & Products Co., New York, and previous to that with the Michigan Smelting & Refining Co., Detroit, died at his home in Cleveland recently. Mr. Berliner was a native of New York.

♦ ♦ ♦

Charles Boltz, 64, president of the Milwaukee Aluminum and Brass Foundry Co., Milwaukee, died recently at his home. Mr. Boltz was born in Rome, Wis. and had been a resident of Milwaukee for 45 years. He organized the Milwaukee Aluminum and Brass Foundry Co. in 1905.

♦ ♦ ♦

Frank G. Wright, 63, retired vice president of the Ohio Steel Foundry Co., Lima, O., died at his home in Lima, Jan. 11. Mr. Wright was born in Oldham, England and came to this country in 1874. Former business connections include the Joseph Reid Gas Engine Co., Oil City, Pa., and the American Steel Foundries. He was manager of the Indiana Harbor, Ind., plant of the latter organization until 1912.

♦ ♦ ♦

Henry M. Kelly, 67, retired manager of the United Engineering & Foundry Co., Youngstown, O., died recently. Mr. Kelly was born in Greenford, July 10, 1867, and at the age of 19 became office boy for Lloyd Booth & Co. He enjoyed successive promotions until in October, 1902 he was made assistant manager of the Lloyd Booth & Co. department of the United Engineering & Foundry Co. He retired five years ago.

♦ ♦ ♦

Oscar P. Snow, a well known foundryman in the Detroit district, died Jan. 7. Mr. Snow was born in 1855 at Charles City, Iowa, and after learning the foundry trade, worked in Freeport and Rockford, Ill. and Beloit, Wis. He also was connected with the Northwestern Foundry Co., Chicago; Detroit Foundry Co., Detroit; Challenge Machinery Co., Grand Haven, Mich.; and Detroit Stoker & Foundry Co., Detroit. For 20 years he was foundry superintendent for the Ford Motor Co. Mr. Snow had three brothers identified with the foundry industry and is survived by two sons, Graham M. Snow, White Star Refining Co., and Robert R. Snow, formerly of Beardsley Piper Co., Chicago and recently in charge of cylinder production with the Chrysler Corp.

♦ ♦ ♦

Horace R. Culling, vice president and manager, Carondelet Foundry Co., St. Louis, died recently. Mr. Culling was born in Dundee, Scotland, and came to this country in 1889. In 1890 he became connected with the Carondelet Foundry Co., in

H. R. Culling

the capacity of shipping clerk and remained with that organization, filling successively the positions of assistant superintendent, superintendent, secretary and vice president and general manager. Mr. Culling took an active part in foundry association work having been chairman of the St. Louis Foundrymen's association, one of the first directors of the Gray Iron institute, and chairman of the St. Louis Foundrymen's club. From 1930 to 1933 he served as a director of the A.F.A.

♦ ♦ ♦

Maitland M. Dunham, 68, special representative of the Hammond Iron Works Co., Warren, Pa., in charge of the New York office, died at the home of his sister in Charlottesville, Va., Jan. 9. Mr. Dunham was born in Enterprise, Pa., and was one of the best known figures in the iron and steel industry in Western Pennsylvania. He was employed as purchasing agent by the Struthers-Wells Co., Warren, Pa., from 1902 to 1919 when he resigned to accept a position with the Hammond Iron Works Co.

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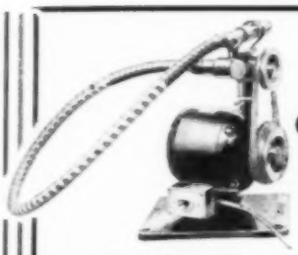
CUT PRODUCTION COSTS—INCREASE PROFITS



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FOUNDRY Superintendents who want to eliminate laborious hand labor—speed up production and get a better finish are choosing Haskins Flexible Shaft Equipment.

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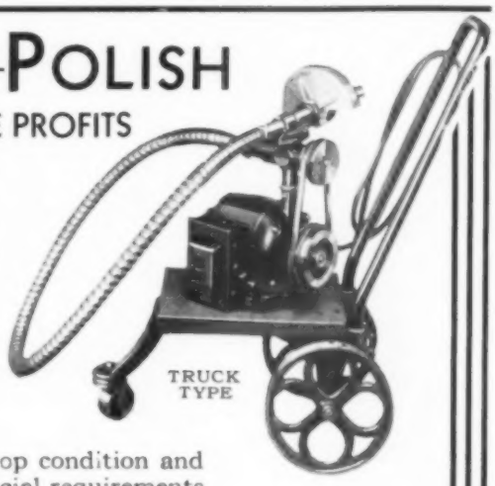

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Haskins Bench, Pedestal, Floor Truck, and Suspended Types fit every physical shop condition and tools have been developed to cover the special requirements of various lines of manufacture.

If you have operations requiring (1) the removal of surplus material, (2) the grinding of drop forge dies, (3) the grinding out of defects, (4) the making of metal patterns, (5) the sanding of flat or curved surfaces, or (6) the polishing of heaviest kinds of castings—then Haskins can save you money and do a better job. Let Haskins Engineers demonstrate the possibilities of cutting your production costs.

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HOW ABOUT THAT MALUMINUM FLUX?
GREAT STUFF. THE METAL RUNS MORE FREELY AND THE CASTINGS HAVE SHARPER EDGES.
DOES IT REDUCE SCRAP ANY?
YES. THERE'S AN INCREASE PERCENTAGE OF GOOD CASTINGS.

FLUXES
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Produces castings of the highest grade with the smallest percentage of blow-holes and imperfections.

Makes cores that have sharp edges and keep them.

Bakes in the shortest time.

Bakes at the lowest temperature.

Stands up when metal is poured.

Leaves a clean core box.

Breaks out of castings with greatest ease.

Gives off the least smoke and gas.

May be mixed in large quantities, and used as needed.

We will be glad to have one of our experienced foundrymen prove to you KORDEK is all we claim for it.

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Man will err . . . but never Nature. The slightest variation in the production of man-made goods often means sub-standard material. **BUCKEYE SILICA FIRE-STONE** Linings, Split or Sawed for

Cupolas - Ladles - Convertors - Soaking Pits

are *natural* products, hewn from the living rock.

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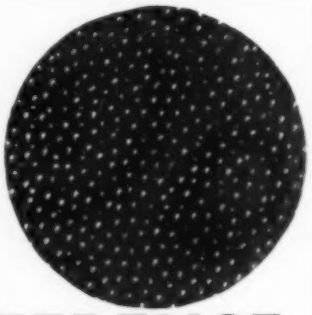

THE DIFFERENCE

Test a sample of American Standardized Steel Shot by letting it run down an inclined sheet of white cardboard. Note its freedom from dirt, small shot or irregular shot. Note its uniformity of size. Remember also that it is made of special analysis metal, hardened by chilling, toughened by heat treating.
THAT'S WHY AMERICAN STEEL SHOT LASTS SO LONG—DOES SUCH EXCELLENT WORK.
Its *uniformity* and *hardness* mean economy for you. Try it.
Write for samples and prices on American Chilled Steel Shot and Grit.

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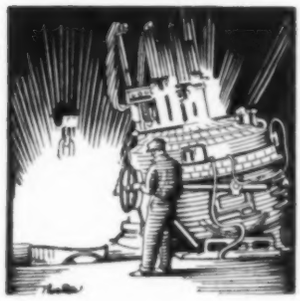


For Foundries

Machine May Have Automatic Control

Osborn Mfg. Co., 5401 Hamilton avenue, Cleveland, has developed a jolt squeeze stripper type molding machine which may be equipped with either automatic or manual control. Automatic control covers jolt, squeeze and draw operations. When the flask

Speed of operation and durability are features claimed for the machine

is filled with sand, the operator pushes a lever which causes the mold to be jolted a predetermined number of blows. The squeeze head then is pulled forward and another lever is pushed which causes the squeeze piston to rise and squeeze the mold at full pressure for a predetermined time interval, after which the exhaust automatically opens and the piston starts on the downstroke. Speed of pattern travel on the downstroke is controlled automatically. Control valves on the manually and automatically operated machines are similar, the difference in operation being that, with automatic control, only one touch of the operating lever is needed to perform the entire operation sequence.

Numerous features of design have been included to provide durability. A long squeeze piston gives prolonged alignment of the piston and a continuous smooth draw. The jolt piston is of the bottom strike design which it is claimed gives the best ramming condition and reduces the strain on the guide pins and bushings. Four hardened and ground guide pins operating in hardened and ground bushings guide the jolt table and lifting frame during the jolt operation. The draw also is guided by four hardened and ground pins operating in hardened and ground bushings.

During the draw operation, the lifting frame is held up by an air piston and cross arm operating at each end of the lifting frame. In the draw position, these arms are held securely against a positive stop by a hold-up piston. After the draw is completed, the lifting frame is lowered by exhausting the air beneath the hold-up pistons, an operation which is accomplished quickly without shock or strain on the machine.

The squeeze head is supported by rigid steel side frames and moves on ball bearing rollers. Lubrication has been centralized, making it possible to lubricate the important parts of the machine from two conveniently located points. This type of machine is available in a range of sizes.

Introduces Riddle

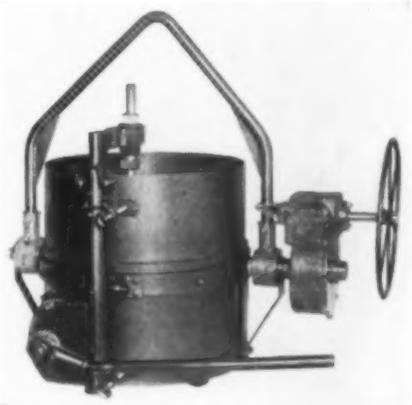
Newman Bros. Inc., Cincinnati, has developed a gyratory riddle which has a frame constructed of steel tubing with a riddle frame of cast steel. The machine has a gear drive and the motor may be removed easily for repairs. A ⅛-horsepower motor, either alternating or direct current may be used.

The gyratory motion may be adjusted to suit particular conditions. The machine may be secured in any desirable height, depending upon the height of the ceiling.

A new arc welding electrode designed for restoring worn cutting edges on tools has been introduced by the Lincoln Electric Co., Cleveland.

Changes Mechanism On Bottom Pour Ladles

Modern Equipment Co., Port Washington, Wis., recently has made changes in its line of bottom pour ladles for foundries. Mechanism for raising and lowering the stopper rod consists of an enclosed oil tight tubular slide of substantial construction to prevent a tendency to warp. The slide member is keyed to the casing to prevent any misalignment of the stopper rod. The entire mechanism is pivoted on the heavy ladle shank rather than on the bowl.



Raising and lowering the stopper rod is accomplished by a rack and pinion

Alignment is provided by adjusting screws above and below the pivot and by the swiveling of the goose neck fixture which holds the stopper rod. The goose neck is adjusted and then clamped in place by two handscrews as shown in the accompanying illustration. The stopper rod is adjustable vertically by a threaded section at the top and can be moved horizontally in the U shaped section at the front of the goose neck.

Raising and lowering is accomplished by a rack and pinion mechanism, and the stopper rod can be held in any position by the manual engagement of a dog and ratchet. The ladle can be supplied with or without the tipping gear and is built in all standard sizes.

Simplicity *Portable* Units

to

Condition Sand

This efficient screen, which has achieved such success in large sand systems, is now available as a portable unit for use on various floors and in connection with mullers.

Heap sands, tempered sands, and finished core sands are screened and areated through fine mesh screen cloth, thereby eliminating impurities.

A Simplicity Sand Slinger can be furnished with this unit at a small additional cost. This areates and piles the thoroughly conditioned sand in fluffy windrows, ready for use without further treatment. Successful installations prove these statements.

"Results are guaranteed"

Simplicity Engineering Company

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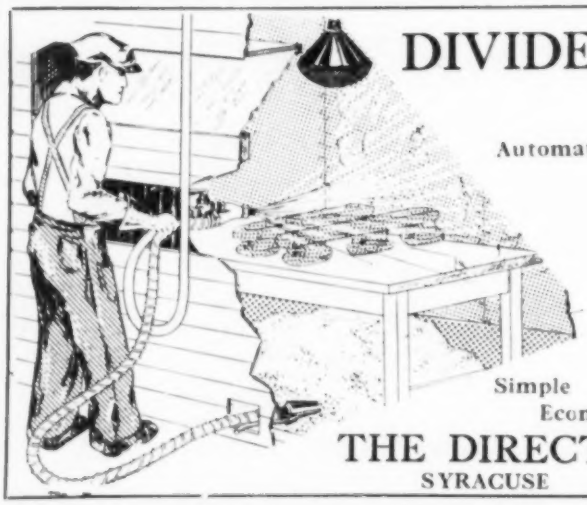

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For removing oil and water
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Automatically Drained — Very Efficient

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For cleaning Castings and Steel
(use Sand, Grit or Shot)

Simple — Efficient — Inexpensive

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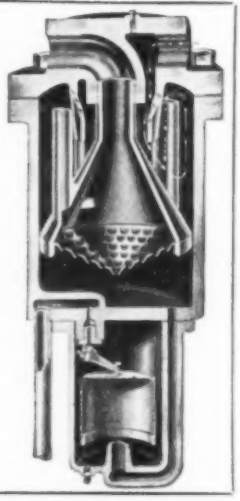

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American Malleable Cast Iron

By H. A. Schwartz

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It covers the history of the malleable industry—its development, modern methods of manufacture, metallurgical principles involved and the properties and uses of American malleable cast iron. It also includes a detailed bibliography in which all the important books and articles published pertaining to malleable iron are listed and represents the only reference work available on the subject.

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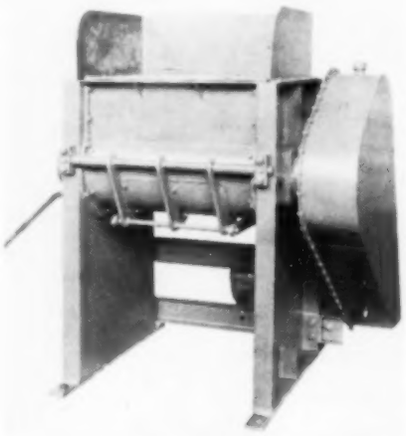
The Penton Publishing Company

Penton Bldg. — ***Book Department*** — **Cleveland, Ohio**

323-I. F. D.

Paddle Type Sand Mixer Is Self Unloading

Baker Perkins Co. Inc., Saginaw, Mich., has introduced a foundry sand mixer, as shown in the accompanying illustration. In this machine, specially designed mixing blades rotate in such a way as to push the sand upward. It is



The machine is designed with interchangeable linings and detachable blades

claimed that this motion aerates the sand while the down motion rubs the sand along the bottom of the pan.

All gearing is enclosed in sand and dust proof housings. Interchangeable linings and detachable blades used are designed to give maximum wear and to provide easy replacement without dismantling the machine. The sand is discharged through a quick-opening gate while the machine is in motion, the sand being forced through by the sweeping curve of the blade. It is pointed out that this self-discharging design permits rapid changes from facing sands to core sands or the reverse, with little cleaning.

The unit is built in four standard sizes for working capacities of 0.3, 5.5, 13.0, 20.0 cubic feet. The smaller unit is a laboratory machine.

Compressor Designed For Heavy Duty Service

Pennsylvania Pump & Compressor Co., Easton, Pa., has introduced a new compressor for air or gas. The unit is of the single-stage, double-acting, horizontal, roller bearing type, adapted for heavy duty service and available in sizes from 5 to 125 horsepower and for pressure from 12 to 150 pounds.

Strength, rigidity, compactness, accessibility and symmetrical proportions are features claimed for the frame of the machine. At the crank end over the main bearings, the frame is open to provide free access to working parts, and has a cast aluminum cover. An auxiliary stuffing box is placed between the cylinder and frame to prevent loss of oil. An important feature of the frame construction is the method of mounting the antifriction bearings in the heavy housing attached at each side. When these housings are bolted in place, the effect is a solid section of the frame over and around the bearings.

The air cylinder and heads are of simple design, well proportioned and provided with ample water jacket around the cylinder walls and through the heads. Large ports connecting the cylinder jackets with the heads allow free and rapid circulation.

Counterpoise Lifts And Balances Equipment

Chicago Pneumatic Tool Co., New York, recently has introduced a simple, sturdily built counterpoise for suspending, balancing and lifting portable tools or objects weighing up to 200 pounds. Combination of a tapered drum, single cable and a new method of applying the spring force gives this counterpoise a long balanced travel. The up and down stopping point is regulated by a mechanically operated gear independent of cable. The top hook is arranged for

The unit may be used for lifting, balancing of suspending portable tools

lateral adjustment thereby assuring proper centering of cable and object.

It is claimed that the single cable construction permits inspection at all times and removal of the cable without disassembling or altering spring adjustments. The cable guide keeps the cable in line with drum groove and prevents jumping. Springs can be adjusted for different loads by a hardened worm.

Grab Bucket Motor Has Special Control

Erie Steel Construction Co., Erie, Pa., recently has made changes in design of its motor-driven grab buckets ranging from ½ to 3-cubic yards capacity. With direct current, special control built by the Westinghouse Electric & Mfg. Co., makes possible the use of

Crane motor, brake and gearing are mounted on the bucket head

only two conductors between the control cab and the bucket.

Since each bucket carries its own motor, the bucket can be attached to cranes, monorail hoists, or any hoisting equipment at which electric power is available. A crane motor, brake and gearing are mounted on the bucket head. Either an alternating or direct current motor can be used. The coupling between the motor and worm gear serves as a braking wheel. All moving parts are lubricated by a forced lubricating system.

Builds Speed Reducer

Dumore Co., Racine, Wis., has introduced a new motor with built-in speed reducer. Three gear ratios can be supplied from stock, 5:1, 14½:1, and 34:1, giving shaft speeds of 1300, 448, and 191 revolutions per minute respectively. The grease type gear housing forms an integral part of the motor frame.

The gear unit is fitted with a single ball thrust bearing. Forced air ventilation is used. The reverse direction of rotation can be secured by fitting the motor with a ball thrust bearing at the end opposite the gear unit.

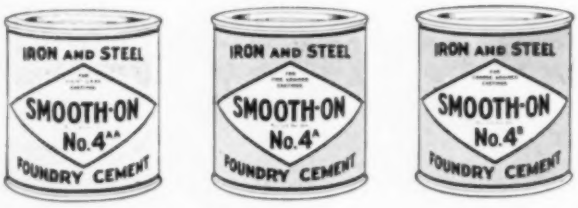
Control Welding

Hobart Bros. Co., Troy, O., has introduced a new volt-ampere adjuster which permits more than 140 combinations of voltage and welding current. The unit is designed for use in connection with remote control of electric arc welding equipment.

SMOOTH-ON No. 4

in improved compositions.

Try them FREE!



No. 4AA No. 4A No. 4B

Smooth - On No. 4AA. For light gray castings and machined surfaces. Has high metallic lustre and takes a fine machine finish.

Smooth-On No. 4A. For medium gray castings. A fine grained cement that has a good metallic lustre.

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THESE three *greatly improved* compositions are our answer to the persistent demand for better metallic lustre, wider color variation and better match of both natural and machined surface.

These compositions applied in the usual way meet ordinary needs, but modification of lustre and shade is easily obtained by rubbing the *dry* powder on top of the applied filling. This lightens the shade.

The free *hardened* samples will show you that our improvement is striking, and application of the free *working* samples will prove that you *can* get perfect match—easily, quickly and cheaply.

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is better than a poor memory for Air Tools!

Ever forget to oil your pneumatic tools? Do your operators ever forget? Air tools suffer from lack of oil or when improperly, haphazardly lubricated. A Norgren Sight Feed Automatic Air Line Lubricator feeds oil to the tool *with the air that drives it.* All the time the tool is in service it is being lubricated, *automatically, continuously.*

It's adjustable, from zero to a constant saturation of the air stream. It guarantees smooth, efficient operation and *there's no other device that will do this job.* Once installed, no Norgren Lubricator has ever been taken off, because it saves far more than it costs. We ship it on trial to any responsible inquirer—if it doesn't make good on your equipment, it's no sale.

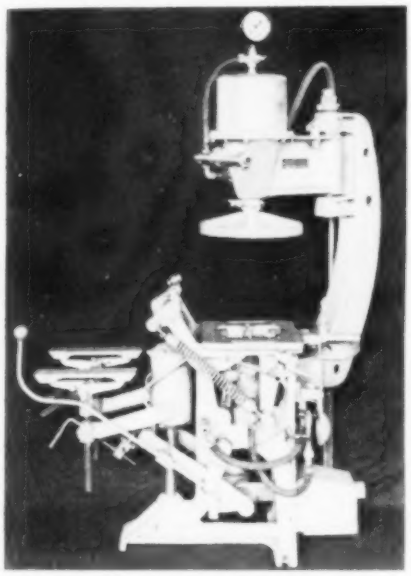
Write for specifications and prices.

Order from this advertisement

C. A. Norgren Co., Inc.
2017 Market St.
Denver, Colorado

Molding Machine Has 8-Inch Pattern Draw

Tabor Mfg. Co., 6225 Tacony street, Philadelphia, has introduced a plain-jar squeeze, rollover and pattern draw molding machine, as shown in the accompanying illustration. This unit has a table 14-inches wide, with an overhead squeeze cylinder 10 inches in diameter. The pattern draw of the machine, which is 8 inches is designed especially to provide a perfect draw of that amount, regardless of wear. Due to a sand proof roller bearing guide, it is claimed that the wear will be exceptionally slight. The machine is equipped with vibrator, pressure gage and blow valve.



The unit has a table 14 inches wide and a squeeze cylinder 10 inches in diameter

Pyrometers Have Three Temperature Ranges

Russell Electric Co., 340 West Huron street, Chicago, has introduced a line of portable or lance-type pyrometers, as shown in the accompanying illustration. Instruments are available for three different temperature ranges of 800-1600-2500 degrees Fahr. The portable hand instruments which are of the low resistance type, will serve for checking temperatures in all applications where a wall type pyrometer is used. The equipment is recommended especially for checking each melt of nonferrous metals to insure the proper pouring temperature.

The instrument may be used to check each melt of nonferrous metals

Develops X-Ray Film

Eastman Kodak Co., Rochester, N. Y., has introduced a new X-ray film with tinted base. It is claimed that in this film, the desirable photographic qualities of high speed, high contrast, extended latitude, low fog and good keeping qualities are combined harmoniously with the highly desirable physical characteristics of freedom from brittleness and tendency to suffer from abrasion, sufficient body to the film to make handling of large sheets easy without crimping, and low fire hazard.

Ventilation of Goggles Is Increased

American Optical Co., Southbridge, Mass., has introduced a new goggle which, it is claimed, practically doubles the area usually allowed for ventilation. The extra ventilation in back of the lenses is provided to keep them free from fogging and steaming and also to keep the area around the eyes cool.

Goggles are provided with a special lenz for adequate eye protection

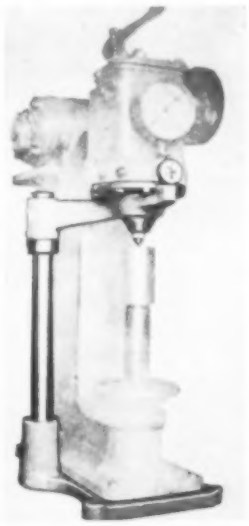
It is pointed out by the manufacturer that hazards of stumbling, falling or colliding with objects because of obscured vision due to fogged lenses is eliminated through ventilation. The goggles are provided with a special lens and provide adequate eye protection.

Builds Bailing Press

Hydraulic Press Mfg. Co., Mount Gilead, O., has introduced a box-type scrap metal baling press in which a heavy sliding door is actuated by a hydraulic cylinder. Pressure is applied to the scrap in two directions, first from the end and then from the side by platens moving into the box. The application of the pressure is controlled through three lever-actuated valves.

Builds Attachment For Brinell Machine

Detroit Testing Machine Co., Trumbull avenue, Detroit, recently has developed an attachment for a brinell machine which permits the operator to check hardness of parts or specimens without the use of a microscope. It is claimed that in most cases, spotting or grinding is unnecessary and good results are obtained on flat, round, or odd surfaces. Tolerance hands are set to the desired limit, and the operator notes whether or not the pointer stops between them.



The indicating instrument is supported independently

The indicating instrument is supported independently, as shown in the accompanying illustration, and errors due to frame deflection or distortion are eliminated. Although developed primarily for use on power driven brinell machines, it may be used on hand operated types where a large number of similar pieces are to be tested.

Combines Pulling Jack and Chain Hoist

Edelblute Mfg. Co., Reynoldsville, Pa., has introduced a combination pulling jack and chain hoist. The unit is a lever operated mechanism, with a lever which works on a ratchet-toothed chain sprocket wheel, and a load chain with a swivel hook. The unit is automatic reversing and the load can be pulled or lowered a notch at a time by turning the reverse latch to its proper position. Hoisting speed is 2 to 4 feet per minute, according to the load. The unit has a rated capacity of 1½ tons and weighs 29 pounds.

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Covered and Insulated Ladles—

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Uniform Hot Metal

They will enable you to handle larger amounts of metal: to save the "drop" in the ladles which previously was "pigged"; to protect your men from the heat and gases of the ladle, thus making for better labor conditions.

In the foundry here shown, the alloy iron in the one ton covered ladle lost only 40° of heat after having been transported 400 ft. and poured into hand ladles for 7½ minutes. Rigid inspection of sand, cores, and molding methods means little without the metal temperature control afforded by these improvements.

Open, obsolete ladles are costing you money daily. Send for our ladle catalogue L-34 and details on ladle covers and insulation.

Good to the last drop!

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Each subject is treated in a thoroughly informative manner to the extent of approximately 20 pages. Original work on the part of the author has been supplemented by thorough and comprehensive investigation of the work carried on by other practical and scientific foundrymen in this field.

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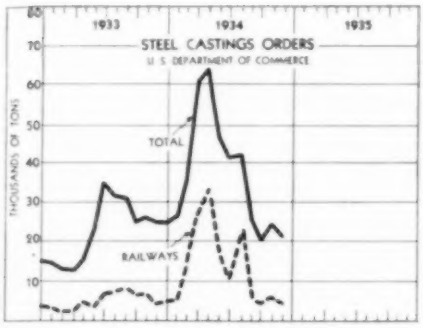
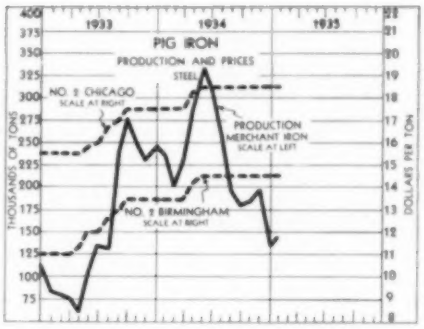
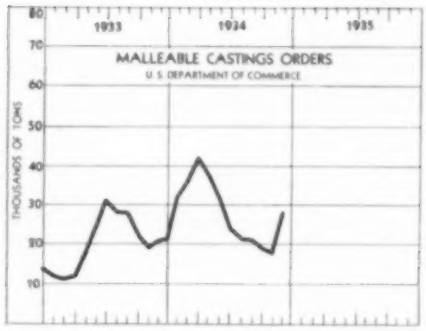
213-S. F. D.







Foundry Activities

Reflect Industrial Trends

FOUNDRY activity in the St. Louis district is holding up well with each week showing a slight gain in output. Jobbing plants are reported benefiting by a considerable volume of miscellaneous business, and also orders for castings from automotive manufacturers. Stove foundries in many instances are making new patterns.

* * *

Atlas Foundry & Machine Co., Tacoma, Wash., recently was damaged by fire.

* * *

Nelli Art Bronze Foundry, Los Angeles, has obtained a permit to build an office and foundry building at 3430 Union Pacific avenue.

* * *

Perfect Circle Co., Hagerstown, Ind., with foundry at Newcastle, Ind., made a total of 57,780,000 piston rings during 1934.

* * *

Bucyrus Casting Co., Bucyrus, O., has been formed by Arthur T. Schuler, William Breymaier and Edward Kline.

* * *

Kankakee Foundry Co. Inc., Kankakee, Ill., has been organized by F. A. Schneider, Leona Suttelle and Edward C. Schneider.

* * *

Federal court recently confirmed a reorganization plan submitted several months ago by the Fulton Iron Works Co., St. Louis.

* * *

Mueller Brass Co., Port Huron, Mich., is planning an expansion program for 1935 and probably will add new equipment.

* * *

United States Brass & Aluminum Foundry has been opened on East Paterson street, Kalamazoo, Mich., by Erwin Doerschler and Thomas Veld. The company will specialize in brass and aluminum castings, matchplates and patterns.

* * *

Brooks Foundry & Machine Co., 521 Marietta street Northwest, Atlanta, Ga., will build an addition to its plant.

* * *

Grand Rapids Malleable Works, Grand Rapids, Mich., is reported to have increased employment from 125 to 175 during the past 6 months.

* * *

American Furnace & Foundry Co., and the American Boiler & Foundry Co., Milan, Mich., are expected to resume operations early in February.

* * *

Newton Foundry Co., Newton, Iowa, recently re-elected Dr. O. N. Green, president; George Nelson, vice president; and F. J. Kelley, secretary and treasurer.

* * *

Bettendorf Co., Bettendorf, Iowa, is expected to reopen its car shop and foundry shortly. J. H. Bendixin is vice president and general manager.

* * *

William Dennick Brass Foundry Inc., Dayton, O., recently has been organized by William C. Dennick and John W. Dale to manufacture brass, bronze and other castings.

* * *

Standard Foundry Co., 1600 Kewaunee street, Racine, Wis., is making plant alterations and additions. A. A. Wickland Co., 205 West Wacker drive, Chicago, is engineer.

* * *

Columbia Foundries Co., Columbia City, Ind., has been incorporated to manufacture automotive parts, by William C. Thomson Jr., Nellie Mae Thomson, and William C. Thomson.

* * *

Duraloy Co., New Cumberland, W. Va., recently has installed a 600-pound, three-phase direct arc-type electric furnace for making special alloys.

* * *

Headford Bros. & Hitchins Foundry Co., Waterloo, Iowa, has reported that business secured during 1934 was the best in 5 years. E. H. Headford is president of the company.

* * *

Sparta Foundry Co., Sparta, Mich., now is occupying its new office building which includes offices, power

(*Concluded on page* 85)

RAW MATERIAL PRICES
Feb. 7, 1935

Iron	
No. 2 foundry, Valley	$18.50
No. 2 Southern, Birmingham	14.50
No. 2 foundry, Chicago	18.50
No. 2 foundry, Buffalo	18.50
Basic, Buffalo	17.50
Basic, Valley	18.00
Malleable, Chicago	18.50
Malleable, Buffalo	19.00
Charcoal iron, furnace	21.00
Coke	
Connellsville beehive premium	$ 5.10 to $ 5.35
Wise county beehive coke	4.30 to 5.30
Detroit by-product coke	8.50
Scrap	
Heavy melting steel, Valley	$13.75 to $14.00
Heavy melting steel, Pitts	13.00 to 13.50
Heavy melting steel, Chicago	11.50 to 11.75
Stove plate, Buffalo	9.25 to 9.75
Stove plate, Chicago	6.50 to 7.00
No. 1 cast, New York	7.00 to 7.25
No. 1 cast, mchy., Chicago	11.25 to 11.75
No. 1 cast, Pittsburgh	14.00 to 14.50
No. 1 cast, Philadelphia	9.50 to 10.00
No. 1 cast, Birmingham	9.50 to 10.00
Car wheels, iron, Pittsburgh	12.50 to 13.00
Car wheels, iron, Chicago	12.00 to 12.50
Railroad malleable, Chicago	13.00 to 13.50
Malleable, Buffalo	12.75 to 13.25
Nonferrous Metals	**Cents per pound**
Castings copper, refinery	7.50
Straits tin	51.12½
Aluminum, 99 per cent	19.00 to 21.00
Aluminum, No. 12 (Secondary)	16.00 to 17.00
Lead, New York	3.50 to 3.55
Antimony, New York	14.50
Nickel, electro	35.00
Zinc, East St. Louis, Ill.	3.70

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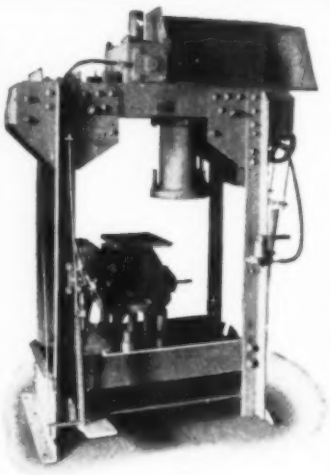
Condulets
Carburetors
Specialties



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Your Correspondence Solicited

Wm. Demmler & Bros.
Kewanee, Illinois

(*Concluded from page* 83)

plants, and laboratories. The old building has been razed.

* * *

Van Wert Foundry Co., Van Wert, O., is to resume operations, after being idle for nearly four years. The plant has been purchased by Samuel Devore of Chicago.

* * *

Imperial Die Casting Co., 4717 West North avenue, Chicago, has leased a one-story building at the Northeast corner of Fulton and Francisco streets.

* * *

Yale & Towne Mfg. Co., Stamford, Conn., recently has contracted for foundry sand handling equipment, including a vibrating shake-out screen, from the Link-Belt Co., Chicago.

* * *

F. Kramer Foundry Co., 6222 Walworth avenue, Cleveland, has been incorporated by John Takacs, John Yako, Joe Kramer and Samuel Racz, to operate a gray iron foundry.

* * *

Western Gas Construction Co., Fort Wayne, Ind., has been consolidated with its parent company, the Koppers Construction Co., Pittsburgh, and will continue its business as the Western Gas Construction division of the Koppers Construction Co.

* * *

Riverside Foundry & Galvanizing Co., Kalamazoo, Mich., has purchased the Gerline Brass Foundry Co., manufacturer of brass, bronze and aluminum castings. The Gerline foundry will be re-opened and operated as the brass division of the Riverside company.

* * *

Index of foundry equipment orders for December, 1934 totaled 66.9 as compared with 80.4 in November and 43.2 in December, 1933, according to the Foundry Equipment Manufacturers association. Index of shipments in December was 81.1 against 59.6 in November.

* * *

Wehrle Co., Newark, O.; Florence Pipe Foundry & Machine Co., Florence, N. J.; Warren Foundry & Pipe Co., Phillipsburg, N. J.; G. M. Hay, Glasgow, Scotland; and Etablisements Zickel-Dehaitre, Paris, France, have secured licenses to manufacture Meehanite from the Meehanite Metals Corp., Pittsburgh.

* * *

Detroit Steel Casting Co., Detroit, early in January relighted a 20-ton open-hearth furnace, pouring the first steel since June 2, 1931. During the past 3½ years the company has been supplying its steel from its electric furnace, increased demand recently necessitating the starting up of the larger unit.

* * *

Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., recently has installed a new direct arc type electric furnace having a capacity of 3 tons per hour on batch cold melting. That foundry already has four other electric furnaces of that type, three being of 1000 pounds per hour capacity, and the fourth 1½-ton per hour.

* * *

Fremont Foundry Co., Fremont, O., recently re-elected Charles J. Miller as president. Other officers are as follows: Vice president, J. L. Dryden, Detroit; treasurer, A. J. Kroenke, Cleveland; assistant treasurer, George Engler, Fremont; and secretary L. N. Allen, Detroit. In addition to the officers, directors are: William Christian, Detroit; Marion K. Kellogg, Detroit; J. R. Kraus, Cleveland; and Myron Miller, Fremont.

* * *

Foundry activity increased during December in the Philadelphia Federal Reserve district, according to reports received by the industrial research department of the University of Pennsylvania. Production of steel castings increased 13 per cent over November, this being the first increase in that division since August. Gray iron foundries, especially those operating in the city of Philadelphia, had only a slight increase in production but this increased activity is contrary to the usual trend during December. The output of malleable iron castings declined for the second consecutive month.

* * *

An item in the January issue reported the organization of the Home Owners Foundry Co. in Louisville. Our correspondent in that city must have been hit on the head just before sending in the item, for we are informed by H. B. Jones, one of the incorporators, that the company formed really is the Home Owners Forwarding Co. As the *Chicago Tribune* would say—We beg your pardon—and as *Time* would note in its acquired sophistication—A severe reprimand to the Louisville correspondent.

New Trade Publications

AFTERCOOLERS — Ingersoll-Rand Co., 11 Broadway, New York, has published a catalog on its line of aftercoolers for air or gas. The equipment is designed to eliminate pipe line trouble through removal of moisture from the air or gas.

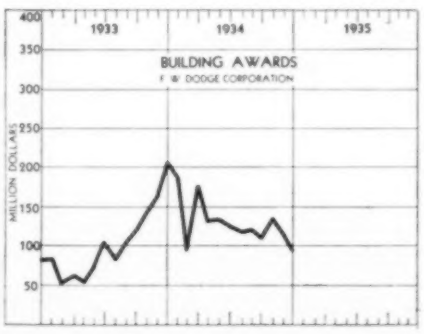
REPAIR CEMENT—Smooth-On Mfg. Co., 570 Communipaw avenue, Jersey City, N. J., recently has published a booklet on its Smooth-On No. 1, used to cement iron and which is especially adapted to home and auto repairs.

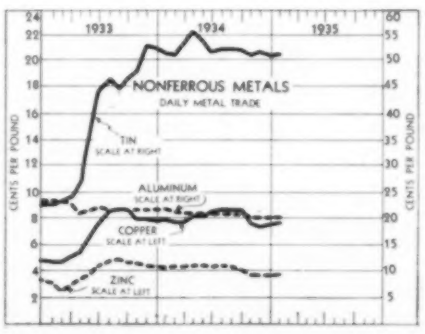
RUBBER CEMENT—Thiokol Corp., Yardville, N. J., has published a bulletin on its oil proof rubber cement which may be used for coating, impregnating, binding and sealing numerous materials.

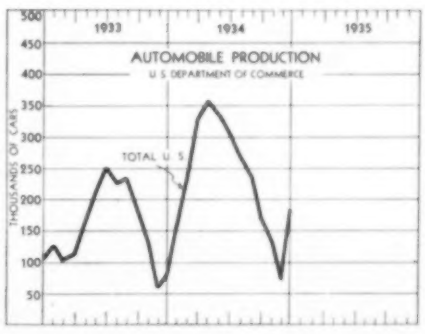
PARTING—Bloomsbury Graphite Co., Bloomsbury, N. J., recently has published a bulletin on its liquid parting, sold under the name of Misto. Information is presented on the features of the new material and directions for using are included.

DIAMOND WHEELS—, Norton Co. Worcester, Mass., has published a booklet covering the story of diamonds in grinding wheels, and discussing the field for diamond wheels manufactured by that company. Information also is presented on how to use the wheels. Illustrations in this booket are exceptional.

REFRACTORIES—Harbison-Walker Refractories Co., 1800 Farmers Bank building, Pittsburgh, has prepared an interesting folder on three of its refractory bricks. One type resists temperatures up to 2900 degrees Fahr., another up to 2500 degrees, and a third up to 2000 degrees. Bulk insulation also is discussed.







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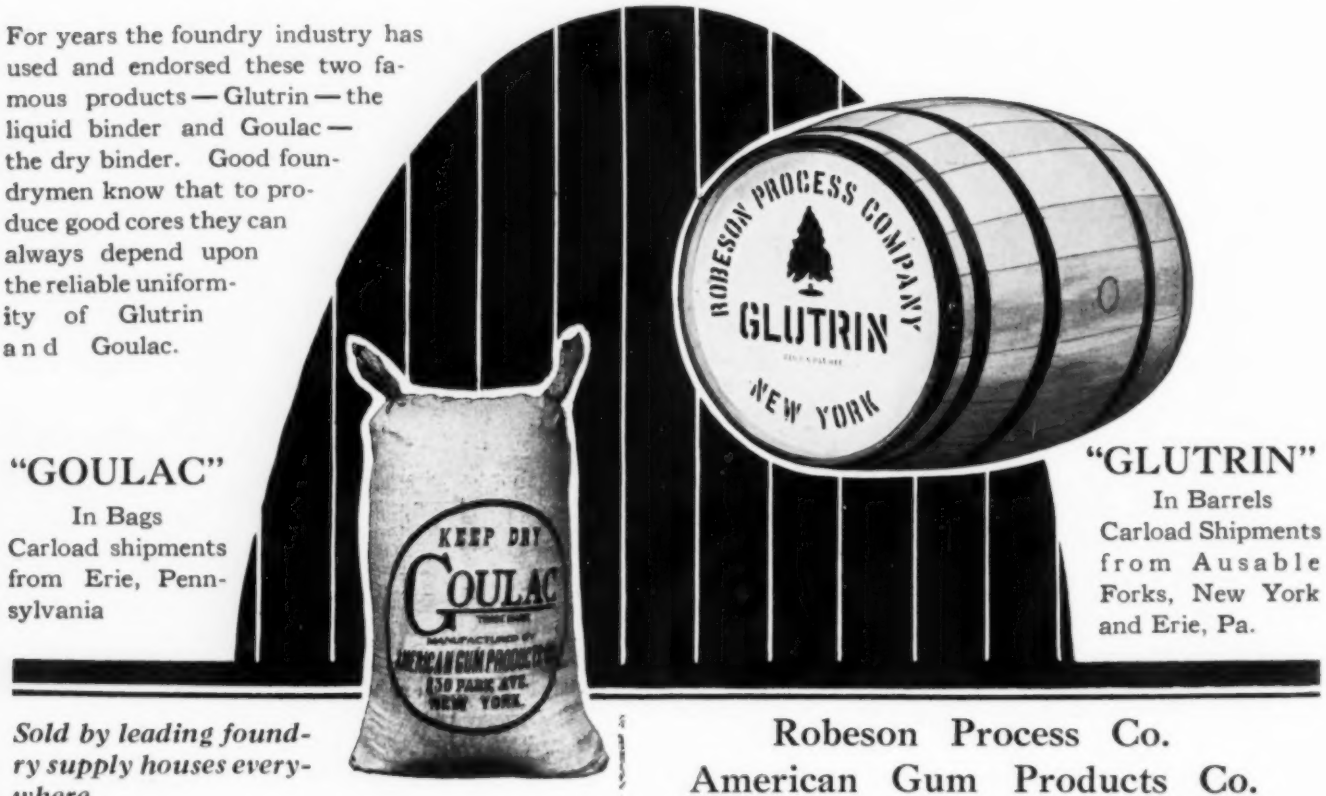

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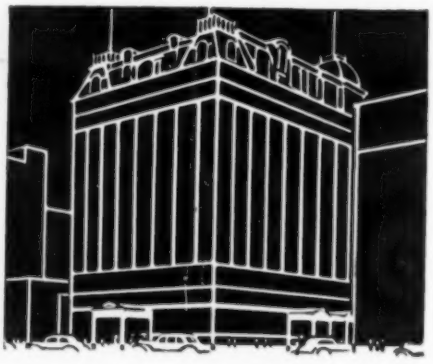

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